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Dr Francis.

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MEDICAL

FACTS AND INQUIRIES,

RESPECTING THE

CAUSES, NATURE, PREVENTION AND CURE

OF

FEVER:

MORE EXPRESSLY IN RELATION TO THE ENDEMIC FEVERS OF SUMMER AND AUTUMN IN THE

SOUTHERN STATES.

TOGETHER WITH A HISTORY OF THE

BILIOUS REMITTING FEVER OF ALABAMA,

AS IT APPEARED IN CAHAWBA AND ITS VICINITY

IN THE

SUMMERS AND AUTUMNS

OF

1821 and 1822.

BY JABEZ W. HEUSTIS, M. D.
Author of Physical Observations and Medical Tracts and Researches on the Topography and Diseases of Louisiana.

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DISTRICT OF ALABAMA, to wit.

Be it remembered, that on the third day of May, A.D. 1825, and in the forty-ninth year of the Independence of the United States of America, Jabez Wiggins Heustis, of the said district, hath deposited in this office the title of a book, the right whereof he claims as proprietor, in the words following, to wit:

"Medical Facts and Inquiries, respecting the Nature, Causes, Prevention and Cure of Fever: More especially in relation to the Endemic Fever of summer and autumn in the southern states; together with a history of the Bilious Remitting Fever of Alabama, as it appeared in Cahawba and its vicinity, in the summers and autumns of 1821 and 1822. By Jabez W. Heustis, M. D. author of Physical Observations and Medical Tracts and Researches on the Topography and Diseases of Louisiana."

In conformity to the act of the Congress of the United States, entitled, "An act for the Encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned."—And also to the act, entitled "An act supplementary to an act, entitled, 'An act for the Encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other Prints."

WILLIAM R. MORRISON,
Clerk of the District of Alabama.

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PREFACE.

FEVER is a disease of such common occurrence, that according to Gorter one third, and according to Sydenham two thirds, of all the disorders to which mankind are liable, are of this description; and it has been a received opinion among physicians, that more than one half of the human race are destroyed by fever alone.*

What an idea must we not have of the malignancy and fatality of the yellow or bilious fever of the West Indies, when we are informed by Dr. Home, that three out of four of his patients in Jamaica were destroyed by the disease? This, however, is by no means equal to the mortality caused by the bilious fever in Natchez, in the summer of 1823; in which, out of four hundred persons that were taken sick between the 15th of August and the 20th of September, only twenty survived.

The inhabitants of Europe, and of large manufacturing establishments in our own country, are subject to a description of fevers called typhus, from the low nervous symptoms which attend them; these, as being of a local and more limited extent, are not the subject of the present inquiry. Those who wish to become acquainted with the typhus fever of England, may consult with advantage the ingenious work of Dr. Armstrong. Nor is it my design to enter minutely into the discussion of the various forms and characters of febrile affections; but my object is more especially the consideration of those fevers which are obviously connected with and originate from heat of climate and noxious exhalations: or in other words, the endemic bilious and remittent fevers incidental to the wide extent of the United States, but especially to its southern section. As a knowledge of these fevers, from the malignancy which they frequently assume, is of the greatest importance to the physician, so every attempt instituted to investigate the laws by which they are governed, their nature, prevention and cure, must thence derive an importance, proportionate to the ability with which it is conducted. The

* Burserius' Practice of Physic, p. 104.

merits of this performance I leave for others to determine.—Having, from careful and mature consideration of facts, drawn the most obvious and practical conclusions, I have at least satisfied myself with respect to many particulars on the subject of fever which have been hitherto neglected, or but slightly and imperfectly remarked and understood.

The outlines of these observations were drawn up during my residence in the southern portion of the United States. Upon my return to the north, I consulted every writer within my reach who had treated on fever, and the relative branches connected with the subject.

In thus presenting myself as an author before the public, I have maturely weighed the responsibility and importance of the step which I have taken. It is now nearly ten years since I first turned my attention to this inquiry, during which time I have carefully examined and considered the subject matter of investigation, so that it cannot be viewed in the light of a hasty, indigested essay, without maturity or experience, but as the result of labor, study and observation. Such as it is, I now offer it to the public. In several instances I have found it necessary to prune, correct and enlarge the crude performance of my more juvenile years; and although I have not the vanity to think that the present work is entirely free from errors and defects, yet I flatter myself that in every point of view these observations will be found of practical utility.

No disease has been the theme of so much discussion as fever, and there is probably none upon which so much has been advanced to so little purpose: but as every subject of scientific investigation must be progressive in its course to perfection, so by improving upon the experience and researches of our predecessors we may hope ultimately to arrive at the summit of human perfection. I might here take up an investigation of the various hypotheses that have prevailed in the medical world on the subject of fever, from the time of Hippocrates to that of Dr. Rush. But a labor of this description would prove as unprofitable in its result as it would be painful and tedious in its performance.

The reader will perceive that I have taken a new view of fever, at least one quite different from any that has lately appeared. I have, indeed, endeavored to trace this disease through all its intricacies and meanderings of its causes and operations to its complete and final developement. And as the fevers which form the subject of the present work are known to be connected with, and to depend upon morbid changes and vitiations existing in the atmosphere, I have, as a leading inquiry, directed my attention to the chemical composition of this element, and have further attempted to show what it is that destroys the salubrity of the atmosphere in certain seasons and situations, and to point out the manner in which this state of the air may be guarded against and prevented.

On the subject of contagion and importation, I have also dwelt at considerable length, and as I conceive have given it a fair and candid investigation. The practical purposes to which this branch of the inquiry more expressly applies, are the police of cities, the enforcement of quarantine regulations, and the intercourse of physicians, nurses and friends, with those laboring under disease. The establishment of just principles, therefore, in relation to this subject, is of the first importance; not only in a medical, but also in a civil and national point of view.

In conducting this inquiry, facts were necessary to establish principles. Of these, therefore, I have availed myself to as great an extent as my time and opportunity would permit, or as the subject might seem to require. I may, perhaps, in the opinion of some, have adduced more examples in proof of the pernicious effects of putrid exhalations, than the general admission of the fact might seem to demand: yet in an investigation of this nature, it is highly necessary and proper that every individual should know the foundation and reason of his opinion and belief; and as the chief object in the prevention of diseases is the knowledge of their causes, it is evident that these cannot be too clearly defined and ascertained.

The present is but a part of a more extended performance, the publication of which is for the present postponed; and I find that in my delay in appearing before the public, I have lost much of the credit that I might otherwise have acquired. Thus the theory of rickets advanced by Mr. Bonhomme, of France, and which has been successfully applied to practice, was entertained and advocated by the author of this work long before the publication of the performance of Mr. Bonhomme. But in the present inquiry I believe I have not been anticipated.

Some, perhaps, will dispute my claims to originality, both as it respects the theory of scurvy and fever. This, however, I must do myself the justice to say, that at the time this work was undertaken my mind was perfectly unshackled by prejudice or preconceived opinion; and that the ideas that suggested themselves were for the most part original and unborrowed; and it was not till I had embarked in a general course of medical reading, with the view of qualifying myself as an author, that I discovered several coincidences of opinion between myself and some former physicians. But these coincidences which I occasionally observed on the part of others, were like random steps taken in total darkness; where one by chance and possibility may be right, and where a hundred in probability will be wrong. They were detached and disconnected, in scattered fragments without order or design; and clouded and beset with so many absurdities, that it appeared clearly the writer had no distinct and definite ideas upon the subject. One kind of scurvy, or fever, for instance, depended on an acid, another on an alkali, another on phlegm, another on salt or an unknown acrimony, and finally on

all the elements, either singly or combined, earth, air, fire and water. These, by fermenting and working, and mixing and straining, and heating and cooling, and boiling and foaming, produced all the various forms and phenomena of fever.

"Fevers," says Hippocrates, "are caused by the bile and phlegm growing hot; these mixing with the blood at first condense and cool it, and occasion the coldness and rigor; afterwards they heat the blood and produce the hot stage."* No better founded are the opinions of many of his successors, who have attempted to account for the nature of diseases upon the supposition of certain qualities and mixtures of the different fluids of the body; for as the properties of these were unknown, of course all reasoning upon their mixtures, changes and chemical action, could have been nothing more than the erroneous vagaries of mere speculation. "Experiments," says Dr. Fordyce, "can only determine the condition of the fluids of the body. Every thing, therefore, that is said with regard to the fluids before the time their properties were investigated by experiments, excepting some of the external appearances of some of the secreted fluids, is to be entirely passed over as not at all relevant to the explanation of the causes of this disease, (*fever*,) or the history of it in any manner. The first part of the blood which was distinctly marked was the serum. Some person about a century and a half ago discovered the red particles. Even Boerhaave was unacquainted with the coagulable lymph; and the properties and varieties which take place in these three essential parts of the blood, are even not well known to the majority of practitioners in Europe. It would appear, therefore, that there is very little ground for resting the cause of disease, whether it be fever or any other, on what has been affirmed of the properties of the fluids by many, even practical authors, for they knew them not, and did not examine them."† "From Willis to Fothergill," says Dr. Beddoes, "and from Fothergill downwards, scarce any real observation occurs upon the state of the blood. One tells us that it is polluted, another that it is contaminated, a third that it is acrid, a fourth that it is putrescent, without recollecting that to employ terms expressive of phenomena, such as the senses may recognize, and to reason upon such phenomena alone, are indispensable conditions in philosophizing."‡

In taking the view of the subject here presented to the public, practical conclusions are established, founded on the latest discoveries and improvements in medical philosophy. As in the time of Dr. Cullen, an investigation of the nature of diseases on the principles of the humoral pathology would have

* Hippoc. De Morb. Lib. 1.

† Geo Fordyce on Fever, &c. p. 158.

‡ Beddoes' Observations on Sea Scurvy, &c. p. 122.

been in a great degree unsuccessful and abortive from the imperfect knowledge of animal chemistry at the time, in like manner the nature and phenomena of many diseases remained unexplained. Many of these difficulties no longer exist, and in the present work I have called to my aid the latest improvements in medical science.

In my attempt to contribute to the cause of my profession, I have aimed at some fundamental pathological conclusions, and have endeavored to establish a practical theory, founded upon the sure basis of facts and demonstration. It is the custom of many to decry theory in physic as vain and unprofitable speculation, and to insist upon the superior advantages of experience, as the only and essential qualification for successful practice.—But it was well observed by Dr. Beddoes, and the same idea is expressed by Dr. Moore, that there are few diseases in which we have any fixed rules of practice, and our specifics are so few, and so easily applied, that this part of medicine may be acquired without difficulty or loss of time. In some instances a theoretical deliberation of some sort must precede prescription, and here the discrimination of persons habituated to speculation will have the superiority of skill over chance, and their facility of resources will appear to peculiar advantage. For, as observed by Dr. Moore,* some diseases appear in such a questionable shape, that the most knowing are puzzled to decide to what class they belong, and the combined powers of experience and sagacity have sufficient employment in treating them. "He who draws medical knowledge from books alone," says Dr. Moore, "and whose exalted notions have not been moderated by experience, will practise medicine as the philosopher who declaimed on the art of war to Hannibal would have commanded an army; but he who has seen much practice without reasoning, as one of Hannibal's pioneers, and he who to extensive experience joins the greatest natural acuteness and all the powers of reasoning, as Hannibal himself." And it is well observed by Dr. Rush, that "a single principle in our science will lead to more truth in one year, than whole volumes of uncombined facts will do in a century."

As this work consists more in demonstration than in theoretical speculation, the facts and illustrations, to whatever purpose they may be applied by others or myself, must be considered of essential practical importance.

My original design was, at first, merely to embrace an historical account and medical illustration of the epidemics of the years 1821 and 1822; but with the view of rendering the work the more generally useful and interesting to the medical reader and to the public at large, I have thought proper to embrace a general history of the causes and treatment of endemic fevers as they

* Medical Sketches.

occur in various places and seasons in the United States; adapting the practice more especially to the fevers of the southern section of our country. And with the design of rendering this treatise the more profitable, I have enlarged upon the practical part considerably more than if I had intended it exclusively for the experienced physician. In this, however, the inexperienced will find an advantage; for it often happens that the young practitioner, who has been more familiar with theory than the bed-side of the sick, finds himself materially at a loss on approaching his patients, at the diversified character of diseases: and upon consulting his best authorities, he is still left in doubt and uncertainty. The general treatment of diseases is described, but so many particulars are omitted, that he finds himself, in a great measure, thrown upon the resources of his own judgment and discretion. To obviate these inconveniences, and to render the work useful to the general community, I have extended the subject of the prevention and cure of fever considerably beyond my original design. As it respects the treatment of fever of 1821 and 1822, I have spoken almost entirely from my own experience; and what has been omitted under these heads may be found discussed at large under the general treatment of fever in the previous part of the treatise. Accounts of the fever of 1821 and 1822, will be found in the latter part of the present work.

In the execution of this performance some inaccuracies have, perhaps, escaped me, as the authorities referred to were principally taken in manuscript during my residence in New-York, in the years 1815, '16, and '17; and the impossibility of again consulting them on the present occasion, must be my apology for the few orthographical errors that may be detected.

As the sense in which the words *epidemic* and *endemic* should be received, has not hitherto been accurately defined by medical writers, it may be thought necessary for me to explain the acceptation in which I employ them. An endemic may be defined, a disease incidental to a country or tract of country, and such as from local peculiarity of climate and situation, or similarity of constitution, frequently occurs: thus the bilious remitting or yellow fever is an endemic of the East and West Indies, and of various parts of the United States. As in each place it has some symptoms which are not observable elsewhere, each district and section of country may be said to be liable to an endemic peculiar to itself. The itch is an endemic in Scotland, and the plica Polonica in Poland. Now as the season and situation may be more or less unhealthy, the endemic may be *epidemic* or *sporadic*; *epidemic*, when it attacks a large proportion of the people; *sporadic*, when it affects only a few scattering individuals. This is the construction which I give the words epidemic and endemic; making endemic the class, and epidemic and sporadic the orders. But there may exist an epidemic without an endemic disease; as is the case with most contagious disorders, as the

small pox, meazles, chicken pox, &c. as likewise influenza and the spotted fever. As these are incidental to every country, and confined to no one in particular, they cannot, with propriety, be called endemics.

By designating the summer and autumnal bilious fevers of the United States, whether appearing in large cities and sea-ports, or in inland situations, the *endemic* fever of the country, I have endeavored to simplify the subject, and to disrobe it of that mystery and terror with which some physicians have endeavored to invest it. A fever originating from offensive docks and filthy streets has received the frightful appellation of the yellow fever; but to designate by that name a disease arising under similar circumstances of heat and putrefaction in the interior of the country, would by the advocates of imported contagion be condemned as heterodox in the extreme. In the view which I have taken, I have considered all the modifications of summer and autumnal fevers as the same disease, diversified, however, in different seasons and situations, in form, violence and degree; but in every instance originating from similar causes.

OF THE CAUSES, NATURE, PREVENTION AND CURE OF FEVER.

CHAPTER I.

Of the causes of Summer and Autumnal Fevers in hot and tropical climates—Chemical and philosophical investigation of the preliminary circumstances of Endemic Fevers—Chemical analysis of the process of putrefaction and decomposition.

SECTION 1.

Introductory Remarks.

FROM a consideration of the circumstances which are generally connected with the origin of fever, there can be little doubt that the most frequent cause of it consists in that vitiated condition of the atmosphere occasioned by animal and vegetable decomposition; so that whatever favors and promotes this process must equally favor the production of fever.

It must be obvious to every person, of even the most limited observation, that the salubrity, or unhealthiness of climates is essentially modified by the temperature and condition of the atmosphere, and by the physical processes which are constantly taking place on the surface of the earth. Thus we find that a high degree and long continuance of heat during the summer and autumnal months, give rise, in various situations, to bilious diseases. We as regularly observe, on the other hand, that the cold of approaching winter puts a stop to the prevalence of these diseases; hence we infer with as much certainty, as from the alternate vicissitudes of light and darkness, which take place upon the rising and setting of the sun, that this luminary is the source of light; with the same certainty we infer that the prevalence and declension of bilious diseases are owing to the successive

vicissitudes of heat and cold, in connexion with other physical circumstances, which is the object of this history to point out and ascertain.

One of the most striking effects of a high temperature is the decomposition or destruction which it occasions in dead animal and vegetable substances. The immediate consequence of this decomposition is the escape of elastic gases, and the corruption or vitiation of the surrounding atmosphere. The effect of this contamination of the atmosphere, as determined by extensive observation, is the production of endemic and epidemic diseases.

Thus we find that the same sun which warms and cherishes the seasons, affording life, support, activity, and beauty to the animal and vegetable world, is also, to the human race, the prolific parent of diseases and death.

Previously to entering into an investigation of the more immediate causes of fever, I shall, therefore, premise a short account of some preliminary circumstances; as the process of putrefaction and decomposition; a chemical consideration of the atmosphere; the vitiations and changes to which it is liable; together with the theory of vegetation.

SECTION 2.

Of the processes of putrefaction and decomposition.

The circumstances required for the putrefaction of dead animal and vegetable substances, are heat, moisture, and exposure to the atmospheric air. The temperature most favorable to the process, seems to range between 75 and 95 degrees of Fahrenheit. A higher degree of heat, by dissipating humidity, impedes or suspends the process. The degree of heat necessary to putrefaction, is much inferior to what is required for spirituous and acetous fermentations, for putrefaction take place at the temperature of 45°; but a higher temperature is still more favorable, at least if the heat be not so violent as to volatilize and dissipate all the moisture of the putrescent substance, and render it entirely dry. Access of air is another circumstance especially favorable and necessary for putrefaction, for it is found that vegetable substances are preserved in vacuo.

A certain degree of moisture is indispensably necessary for decomposition. When animal bodies are suddenly deprived of their humidity and aqueous juices, they become hard, dense, and incorruptible, like petrifactions. This is exemplified in the arid and sandy deserts of Egypt and Ara-

bia, and also in some parts of South America; where, notwithstanding the heat of climate, the dryness of the atmosphere and soil prevents putrefaction by the rapid exsiccation of the animal juices which it occasions. By an increase of caloric, the quantity of water which the atmosphere is capable of holding in solution, is also increased. Now the air in passing over these parched and sandy deserts, where there are no trees, herbage, nor aqueous exhalations to refresh it, becomes intensely heated by the scorching sun, so that its capacity for water is greatly augmented; from which circumstance it happens that every thing is robbed of its humidity which is capable of affording it, and animal bodies are converted into mummies. We are informed by the learned Dr. Shaw, in his travels from Egypt to the Holy Land, that he saw in the deserts, the bodies of some dead camels, which had belonged to a former caravan, and remaining in a state of preservation, entirely free from putrefaction.*

* The destruction of caravans and travellers in the deserts of Asia and Africa, is frequently caused by the fatal breeze called *Samiel* wind, a blast of which, in those parched deserts, proves instantly fatal to the unfortunate traveller or beast, that may be exposed to it These winds seem to produce death by suffocation, in consequence of their depriving the lungs of the ability to perform their function, and not by any pestilential poison in the air itself It appears from the experiments of Dr. Priestley, that oxygen gas will not act upon the blood through dry membrane, and that a moist state is necessary for this purpose. This dry and parched air of these sandy deserts instantly absorbs the moisture from the delicate membrane forming the air cells of the lungs, and thereby prevents the oxygen of the atmospheric from performing its purifying operation upon the blood. The effects of this air upon the surface of the body, are similar to those upon the lungs; it shuts up the pores of the skin, and puts an entire stop to perspiration. These reflections were made previous to my seeing those of Mr. Volney upon the same subject; who says, in his description of the *Kamsyn*, (which may be considered the same as the Samiel) that the lungs are irritated by the presence of this air, are contracted and rendered crisp. "This wind," continues he, "crisps the skin, evaporates animal moisture, closes the pores, and produces febrile heat which always accompanies suppression of the perspiration." The effect of this hot suffocating blast or vapour, (the Samiel) says Dr. Lind, on the human body, even when mitigated by passing through a moist atmosphere, is the same as that of intense cold; it shuts up every pore of the skin, and entirely stops the perspiration of such as are exposed to it. They come on only in the day time, and always from the deserts. Water is the only known antidote or corrector of this vapour. (*Lind on Hot Climates, p.* 144.) It appears from the experiments of Saussure, that a cubic foot of atmospheric air will hold eleven grains of water in solution; from five to ten grains, however, is the usual quantity contained in every cubic foot. A certain degree of humidity is necessary to preserve substances upon the surface of the earth in a proper state of moisture and pliability. During a season of the year the wind called the *Harmatan* prevails in the interior of Africa, which is so extremely dry, from passing over the sandy deserts, that furniture of houses is destroyed by it, the floors and joints of

It is owing to a want of access of air to favor decomposition, that the accumulation of soil constituting peat and morass is so inert and unproductive. The cultivators of cotton about Baton Rouge, and the lower parts of the Mississippi, as they find the top of the soil which is alluvial, impoverished by repeated crops, remedy the evil by ploughing deep with a strong team of cattle, thereby exposing the mould, which has been hitherto excluded from the air, and again rendering the earth fertile and productive.

buildings are laid open, and the scarfskin on the human body is rendered crisp and peels off.

We are informed by Wafer, an English surgeon, that he and some others landed at Virmejo, in South America, in 1687, and marched about four miles up a sandy bay. "All which," he says, "we found covered with the bodies of men, women and children; which lay so thick, that a man might, if he would, have walked half a mile, and never trod a step off a human body. These bodies to appearance seemed as if they had not been above a week dead; but if you handled them, they proved as dry and light as a sponge, or a piece of cork. After we had been some time ashore, we espied a smoke, and making up to it, found an old man, a Spanish Indian, who was ranging along the sea-side, to find some dry sea-weeds, to dress some fish, which his company had caught; for he belonged to a Spanish boat hard by. We asked him many questions in Spanish about the place, and how the dead bodies came there. To which he returned for answer, that in his father's time, the soil there, which now yielded nothing, was green, well cultivated, and fruitful. That the city of Wormia had been well inhabited by Indians, that they were so numerous, that they could have handed a fish from hand to hand twenty leagues from the sea, until it had come to Inca's hands; and that the reason of these dead bodies was, that when the Spaniards blocked up and laid siege to the city, the Indians, rather than be at the Spaniards' mercy, dug holes in the sand and buried themselves alive.—The men as they now lie, have with them their broken bows, and the women their spinning wheels and distaffs with cotton yarn upon them." *Voyage and Description of the Isthmus of America.*

Fuzier, a French voyager, who was also in Peru in 1712, confirms the same account. He says, "The vale of Hilo, in which there are not at present more than three or four families, maintained an Indian town, the remains of which are still to be seen, two leagues from the sea; a dismal effect of the ravages the Spaniards have made among the Indians. There are still more moving marks of the misfortunes of that poor nation, near Arica, above the church of Hilo, and all along the shore as far as the point of Colos, being an infinite number of tombs, that when they dig up at this very time, they find bodies almost entire, with their clothes, and very often gold and silver vessels. Those I have seen are dug up in the sand, the depth of a man, enclosed with a wall of dry stone; they are covered with wattels and canes, on which there is a layer of earth, and sand laid over, that the place where they were might not be observed. They were so terrified that they thought they must die, when they were informed that the Spaniards had not spared their beloved Atalahalpa, who among them was looked upon as the offspring of the sun, which they worshipped. Therefore to escape out of their hands, they fled as far as they could eastward, to implore the mercy of the sun; but being stopped by the sea, they buried themselves alive on the edge of it." *Relation du Voyages de la Mer du Sud.* The preservation of these bodies appears to have been the effect of dryness and exclusion from atmospheric air.

The influence of heat and moisture in favoring decomposition seems to consist in expanding and attenuating the corruptible substances, thereby enabling the elementary matters to come more intimately within the sphere of each other's attraction. Animal substances are more prone to decomposition than vegetable matter, on account of the laxity of the former, and their consisting of a greater number of elements, which begin to exert their respective affinities as soon as the vital principle is extinguished. These vegetable substances, which consist of but one or two elements, as wax, resin, gum, oil, under ordinary circumstances, are scarcely susceptible of decomposition. Atmospheric air is necessary to this process, by affording the principles with which the decomposing matter may combine. This is illustrated in the preservation of vegetable substances in vacuo. Accession of air, however, is a less essential requisite than heat and moisture, since the phenomena of putrefaction sometimes take place without exposure to it, especially in animal substances.*

* The following account of the singular discovery of the carcass of a mammoth, given by professor Cuvier, as taken from a report in the supplement to the *Journal du Nord*, No. 80, by M. Adams, adjunct member of the Academy of St. Petersburg, is interesting, as affording an illustration of the preservative power of cold upon dead animal bodies, and of the necessity of heat for their putrefaction. As no account of this animal is preserved in natural history, and as the only knowledge we possess of its former existence is from the remains which have been discovered, it is probable that this carcass might have been preserved in this block of ice more than two hundred years previous to its discovery. By what accident, convulsion, revolution, or phenomenon of nature, it became placed in this situation, is not the object of the present inquiry to investigate.

"In the year 1799, a Tungusian fisherman observed a strange shapeless mass projecting from an ice bank, near the mouth of a river in the north of Siberia, the nature of which he did not understand, and which was so high in the bank as to be beyond his reach. He went next year, observed the same object, which was then rather more disengaged from among the ice, but was still unable to conceive what it was. Towards the end of the following summer, 1801, he could distinctly see that it was the frozen carcass of an enormous animal, the entire flank of which, and one of its tusks, had become disengaged from the ice. In consequence of the ice beginning to melt earlier and to a greater degree than usual in 1803, the fifth year of this discovery, the enormous carcass became entirely disengaged, and fell down from the ice-crag on a sand-bank, forming part of the coast of the Arctic Ocean. In the month of March, of that year, the Tungusian carried away the two tusks, which he sold for the value of fifty rubles; and at this time a drawing was made of the animal, of which I possess a copy.

"Two years afterwards, or in 1806, Mr. Adams went to examine this animal, which still remained on the sand-bank where it had fallen from the ice, but its body was then greatly mutilated. The *Jukuts* of the neighborhood had taken away considerable quantities of its flesh to feed their dogs; and the wild animals, particularly the white bear, had also feasted on the carcass; yet the skeleton remained quite entire, except that one of the fore-

In the chemical composition of animal substances, are discovered, hydrogen, which is the principal base, combined with a large portion of nitrogen, charcoal, oxygen, phosphorus, and not unfrequently sulphur. All the fluids, and what are called the soft solids of the animal body, undergo decomposition with greater or less rapidity when exposed to a temperature of 65° or more. When exposed to the air under such a temperature, the muscular fibre becomes pale, soft, and relaxed, exuding a coloured serosity; with the destruction of its organization, its smell becomes insipid and disagreeable; the altered substance, by degrees, decreases in bulk, and its smell becomes ammoniacal. After this, if it be preserved in a close vessel, the putrefaction proceeds more slowly, and nothing but an alkaline pungent smell is perceived from it; the matter effervesces with acids, and turns syrup of violet green. But when air is admitted, this urinous exhalation goes off, and a peculiar, suffocating, putrid smell is rapidly evolved. This smell, says Fourcroy, continues for a long time, penetrates every where, and seems to affect the bodies of animals, like a fermenting substance, capable of altering their fluids. This smell is corrected, and in some measure confined by ammonia: the latter substance, formed by the union of the nitrogen and hydrogen of the animal matter, is one of the principal gaseous results of putrefaction. It is evidently this, says Accum, that fills the cavities of the celular texture, so as to inflate and puff up the body. After the volatilization of the am-

legs was gone. The entire spine, the pelvis, one shoulder-blade, and three legs, were still held together by their ligaments, and by some remains of the skin; and the other shoulder-blade was found at a short distance. The head remained, covered by the dry skin, and the pupil of the eyes was still distinguishable. The brain also remained within the skull, but a good deal shrunk and dried up; and one of the ears was in excellent preservation, still retaining a tuft of strong bristly hair. The upper-lip was a good deal eaten away, and the under-lip was entirely gone, so that the teeth were distinctly seen. The animal was a male, and had a long mane on its neck.

"The skin was extremely thick and heavy, and as much of it remained as required the exertions of ten men to carry away, which they did with considerable difficulty. More than thirty pounds weight of the hair and bristles of this animal were gathered from the wet sand bank, having been trampled into the mud by white bears, while devouring the carcass. Some of the hair was presented to our Museum of Natural History, by M. Targe, censor in the Lyceum of Charlemagne. It consists of three distinct kinds. One of these is stiff black bristles, a foot or more in length; another is thinner bristles, or coarse flexible hair, of a reddish brown colour; and the third is a coarse reddish-brown wool, which grew among the roots of the hair. These afford an undeniable proof, that this animal had belonged to a race of elephants inhabiting a cold region with which we are now unacquainted, and by no means fitted to dwell in the torrid zone. It is also evident that this enormous animal must have been frozen up by the ice at the moment of its death."

monia, the putrefaction proceeds with new energy: phosphuretted and sulphuretted hydrogen gases are disengaged, lastly carburetted, or oxy-carburetted hydrogen gases are evolved; it now shrinks again, its colour is altered, and the fibrous texture of the flesh is now scarcely distinguishable; it is converted into a soft pulpy matter, of a brown or greenish colour; its smell is insipid and nauseous, but acts with great energy on animal bodies. This odorous principle, at length, loses its strength, the fluid part of the flesh becomes, in some measure, consistent: its colour becomes deeper; and it is at last reduced to a friable matter, half dry, yet deliquescent, which by friction with the fingers, breaks into a coarse powder, like earth.

A much lower temperature is required for the putrid fermentation of vegetable substances, than for the vinous or acetous: decomposition takes place in a medium of 45°; but a higher degree of heat is much more favorable to the process, provided it is not so great as to entirely dissipate moisture. When vegetable substances putrefy, they become turbid, lose their colour, and deposit various sediments; if immersed in water, bubbles ascend to the surface, and a green mould gathers on the surface at the beginning of the alteration. Soft vegetable matters, exhibit the same appearance on being wet or exposed to damp. The commotion produced, is not so considerable as that which appears in the cases of spirituous and acetous fermentations: the decomposing vegetable substances do not increase in size, nor is their temperature augmented: a change of smell is remarkable with a urinous odour, and towards the end of the process, ammonia is evolved. The latter, however, is disengaged in greatest abundance from the vegetable substances that contain nitrogen in their composition, and thereby more nearly approach to the chemical properties of animal matter; such as cabbages, potatoes, onions, the flour of wheat, the tetridinamious class of plants, mushrooms, gelatinous vegetables, &c.: this approximation to the chemical composition of animal substances increases the tendency of these vegetable matters to spontaneous decomposition. In the decomposition of vegetable substances, there is not, in general, as in the putrefaction of animal matter, any disengagement of the putrid combinations of sulphuretted and phosphuretted hydrogen gases. Of all the elastic aeriform emanations, carburetted hydrogen gas is that which seems to be evolved in the most considerable quantity from decomposing vegetable matter. It is this which is constantly exhaling from swamps and morasses. Dr.

Seybert, of Philadelphia, found the quantity of this gas, disengaged from a mixture of mud and water, so great as to occasion a violent explosion of the bottle in which the mixture was made. As this gaseous compound is the most abundant product of spontaneous decomposition in the mouldering mass of extinct vegetation, so does it seem to be the most essential requisite and principal ingredient in the economy of vegetable growth. All vegetable substances ultimately undergo decomposition. The greater or less facility, however, and the rapidity with which this process takes place, depend upon the different states of laxity or density in their texture, and their being more or less soluble in water. Those which are the most soluble are the soonest to undergo decomposition.

From the evolution of ammonia, putrefaction has been called *alkaline fermentation*, and ammonia considered as its product. Towards the close of the decomposition of vegetable substances, the pungency which is exhaled in the height of the process has become dissipated, and is succeeded by a degree of nauseous insipidity. The decomposition having attained its height, the putrid vegetable mass, becoming very soft, sinks down into a gelatinous consistence, and the odorous principle exhaling from it undergoes many successive modifications; at length, losing its disagreeable smell, it becomes dry; and a blackish, carbonaceous residuum remains, known by the name of *humus vegetabile*, consisting of saline and earthy substances.

SECTION 3.

Composition of the atmosphere—Eudiometry no test of its purity.

The atmosphere may be considered as a great chemical laboratory and receiver, in which all the attenuated and volatilized productions of terrestrial bodies are received, mingled, agitated, combined, and separated,* and although the two essential constituents of the atmosphere are nitrogen and oxygen, in the proportions of twenty-one parts of the latter to seventy-five of the former,† yet from the various

* Park's Chem. Catechism.

† The precise proportions of these elements, together with aqueous vapour and carbonic acid gas, which are always present, according to Mr. Henry are as follows:

Nitrogen gas,	75.5 by measure,	75.55 by weight.
Oxygen gas,	21	23.32
Aqueous vapour,	1.42	1.03
Carbonic acid gas,	.8	.10

chemical combinations and decompositions which are almost constantly taking place upon the surface of the earth, the air which we breathe is liable to be vitiated by the various admixture of heterogeneous substances, deleterious in their properties to animal life, and foreign to the composition of the atmosphere itself. The nitrogen and oxygen which form the atmosphere, are merely in a state of mixture, not of chemical combination: and it has been proved by Mr. Dalton, that whenever two or more of the permanently elastic fluids come in contact, they penetrate each other, and form an equable mixture; and that, therefore, a lighter gas cannot for any considerable time float upon the surface of a heavier, but the mixture of the two elements becomes intimately diffused and blended; in the same way that distilled spirits, which is a lighter substance than water, becomes intimately blended with it, when poured into and agitated in the same vessel.

As already observed, the atmosphere is liable to become contaminated by various admixtures foreign to its nature, resulting in a great degree from the decomposition of animal and vegetable substances. The degree of this vitiation, however, is not to be determined by chemical tests; the most certain, and indeed the only criterions by which it can be ascertained, are the appearance of physical causes, and the morbid effects produced upon the human constitution. Philosophy may blush for the imperfection of her boasted wisdom and sagacious powers of investigation, when it is considered that the constitution of man is the only infallible eudiometer,* by which the purity or impurity of the atmosphere can be satisfactorily known. The experiments of Dr. Priestley, and the researches of De Marti, have ascertained that the air of places the most offensive and unwholesome, affords as much oxygen as that of others of an opposite description; the air, for example, of crowded cities, on the summits of the loftiest mountains, and in the bottoms of the deepest vallies, has not been found to vary in the proportion of its two constituent elements; the noxious qualities of the atmosphere depending, not on the deficiency of oxygen, but on the admixture of deleterious substances, beyond the power of eudiometry to detect. It is a lamentable fact, that such is the imperfection of science, and the grossness of chemical experiments, that eudiometry can discover no difference between the air of an infected prison, the atmos-

* An eudiometer is an instrument or apparatus employed for measuring the purity of the atmosphere.

phere of a swamp loaded with sickly vapors, and the deleterious products of animal and vegetable decomposition, and that of the most salubrious situations. It even appears from the experiments of Dr. Davidson, of Martinique,* that the atmosphere of the tropics contains a greater proportion of oxygen than that of northern climates. These experiments are confirmed by those of Dr. Chisholm. M. Seguine has, also, analyzed the air of hospital wards, which had been constantly shut up for the space of twelve hours, and, for all that he could discover, it appeared to be almost as pure as the open atmospheric air, although it had an insupportably offensive smell. Bertholet, likewise, in his analysis of the atmosphere, found that the air of Egypt did not differ in its physical and chemical properties from that of the most salubrious climates of Europe; and this was demonstrated even when the plague prevailed in that country. To these curious facts may be added the experiment contained in the memoir of Gattini. This experiment was made August 15th, 1779, on the stagnant air of the offensive marshes of Fort Fuentis, at the mouth of the river Vatteline, where bilious fevers constantly prevail in the summer season. And such is the unhealthiness of this place, that, according to Gattini, whoever ventures to sleep in that situation during the summer season, is sure to be attacked by an intermittent: the air of that place was compared with the air on the summit of Mount Legnone, which, always covered with snow, forms a chain with the lofty mountains of the Grisons, and is elevated above the level of the sea about 8,640 feet. On comparing these two portions of air in the eudiometer, with the utmost exactness, the air of the marshes was found to be two degrees purer than that from the summit of Legnone. Though this experiment was repeated as often as fifteen times, varying all the circumstances of time, season, &c. the result was still the same.

That the air of the infected places where these experiments were performed was contaminated, there can be no question; that this vitiation was not discoverable by the tests employed, proves the imperfection of these experiments themselves, and leaves the field open for the discovery of more improved and accurate researches.

* See an account of these experiments, contained in a letter to Dr. Mitchell, dated Port Royal, April 7, 1798. Medical Repository, vol. 2.

SECTION 4.

Economy of Vegetation, and its relation to the Causes and Origin of Endemic Fever.

It appears from numerous and extensive observations that the principles of vegetation and the causes of fever are intimately connected, and so closely and inseparately allied as to render probability almost certain, that the sources and nature of the causes of both are analogous. We know that where the principles and requisites of a luxuriant vegetation exist in the greatest abundance, there also fever, as an endemic, is apt to prevail. Heat and moisture are essential to putrefaction, and the consequent production of vegetable growth. These circumstances are the most conspicuous in the low and marshy situations of hot and tropical climates, along the margins of rivers and creeks, and near ponds of stagnating water; in such places, also, endemic fever is a common occurrence; whilst, even in the same climate, where the country is high and dry, and in hilly situations above the reach of inundation and the miasmata of the low grounds, swamps and water courses, fever as an endemic is scarcely known: much less in cold and northerly climates similarly situated with respect to elevation and dryness.—We may remark, however, that there are some low and marshy situations, which, abounding with an excess of the necessary ingredients, are, notwithstanding, covered with a stinted crop of vegetation: here the superabundant stimulus of nutrition, as in the animal kingdom, proves unfavorable to a healthy and vigorous growth; whilst at the same time the light and spongy mould of which these marshes consist does not afford a foundation of sufficient firmness and solidity to admit of the support of large and luxuriant vegetation. As in such instances the principles of vegetation which are evolved from this mass of corrupting materials are unappropriated to the growth of plants, they will float in the atmosphere, and show their deleterious effects upon such persons as live within the extent of their diffusion.

Since the corrupting materials of the physical world afford food, nourishment and growth to living plants, it follows, that provided vegetation is sufficient for the consumption of the products of animal and vegetable decomposition, the atmosphere will preserve its purity. Although places abounding with the requisites of a luxuriant vegetation are,

on that account, the least healthy, still the position generally holds true, that the more copious and luxuriant vegetation is in any situation, the more healthy will that place be rendered: for the consumption of the gaseous results of animal and vegetable decomposition, upon which processes the insalubrity of the atmosphere depends, will purify the air in proportion to the quantity of these morbific materials appropriated to the growth of vegetable matter. We have a striking and convincing proof of the pernicious influence of miasmatic emanations from corrupting substances, in the first settlement of towns and districts in a hitherto wild and uncultivated country, where the land is suddenly cleared of a flourishing and exuberant vegetation by which it was formerly shaded; and in the progress of cultivation an unusual quantity of vegetable mould is ploughed up and exposed to the action of the air and sun; whilst at the same time, from the destruction of the trees, the country is deprived of the natural agents by which the accumulation of noxious exhalations in the atmosphere was prevented. From this view of the subject, we may explain a fact of frequent observation, that swamps and new lands are prevented from exerting any pernicious influence when planted with vegetables of rapid growth, as the sugar-cane, Indian corn, and other plants of quick and great luxuriance, which consume, and appropriate to their nourishment and increase, a large quantity of the putrefactive products.

We are informed by Dr. Rush, in his account of the climate of Pennsylvania, of its being a well known fact, that intermittent and bilious fevers had increased in proportion as the country had been cleared of its wood in various parts of the state. And on the contrary, of its being equally certain, that these fevers diminished or disappeared in proportion as the country became cultivated.*

In illustration of the circumstance, that vegetation conduces to health, we are informed by Dr. Williamson, in his history on North Carolina, that families who live in the Dismal Swamps, without a perch of clear or dry ground, enjoy more health than people who live on their new plantations, near the rivers and swamps. He observes, that the bad effects of recent cultivation, by which decaying vegetables are exposed to the sun, are severely felt in flat countries and warm climates. Carolina was less sickly before the country was opened. The second colony of adventurers remained twelve months in the country, and they lost only

* Med. Inq. and Obs. vol. 1, p. 44.

five men out of one hundred and seven, though they were badly sheltered and suffered much from the scarcity of provisions. A gentleman in Craven county had lived on his farm about forty years without suffering by intermittent fevers, though his family consisted of fifty or sixty persons. There were about one hundred and fifty acres of cleared ground in front of his house that had been cultivated many years, but a thick wood extended in the rear of his dwelling. In the beginning of the year 1785, he caused all the timber and shrubs that were behind his house, within four or five hundred yards, to be cut down: his object was pasture, and a free circulation of air. One third of his family, the next summer, were taken down by intermittent fever; though such complaints were not more prevalent than usual during that summer, in other parts of the flat country.

This fact is also illustrated by Dr. Scott, in his account of the fever of Gennessee county, in the state of New-York. We are informed that though the land, previously to its being cleared, was very moist, yet the first settlers were healthy; but as the trees were removed, the inhabitants became subject to severe attacks of a very malignant fever, until the whole country became a scene of mortality, and many died vomiting black matter in the greatest extreme of anxiety and pain; while others would walk about, saying they were quite well, until within a few hours of their dissolution. But after vegetation was established and had become general, the country was again rendered more healthy.* This subject will be further illustrated when we come to speak of the fevers of Alabama.

That judicious and accurate observer, Dr. Robert Jackson,† has remarked, that the rise and progress of endemic fever are evidently connected with the different periods of the season. In spring, the principle of vegetation is extricated in great quantity, while the capacities of plants are still small; an excess is consequently generated, and this excess extends its influence to a certain distance around. In summer, the extrication of the principle still increases, but the capacities of plants having extended in a greater proportion, the means are more adequate, and the excess is actually less. In autumn, the growth of plants being completed, while the causes still continue to produce a great extrication of the principle of vegetation, the excess abounds and escapes in a wider circle.

* Med. Repository, Vol. X.
† History and Cure of Fever, chap. iii.

It appears that the leaves of plants perform a function in their economy analogous to that which takes place in the lungs of animals and the gills of fishes; in other words, that the leaves are to vegetables, what the lungs are to the animal creation; and that the leaves may therefore be called the lungs of plants. During the spring of the year, previous to the developement of the leaves, and in the early part of the day, whilst the sensibility of the plant is greatest, the sap rises by the stimulus of heat, through the alburnum or sap of the wood, and falls by the same vessels when the heat is withdrawn, or considerably diminished; hence it happens, that if a tree be pierced at this period, the sap exudes through the wound, because there is no other outlet. By the process of vegetation, however, a new channel of communication is opened, and the sap is now protruded onwards and circulates through the leaves, from which a copious transpiration takes place; and as the sap now descends through the liber, or inner bark, the tree no longer bleeds.

The alburnum, or what is called the sap of the wood, passing from the branch is expanded through the parenchyma of the leaves, in the form of ribs and smaller vessels, through which the sap circulates. The leaf itself is covered with a cuticle or scarfskin, both on its upper and lower surface; the latter is supposed to absorb, and the former to transpire. As in the animal body, so the vessels of plants appear to have at least two terminations, one in transpiring, the other in returning vessels;* by the former, the redundant and watery part of the sap is exhaled in copious quantity, whilst the remainder, having undergone the necessary change, returns through the appropriate vessels of the leaves and bark, and is finally deposited in a pulpy state on the exterior surface of the alburnum, where, after being sufficiently inspissated and hardened, it forms a portion of the growing plant.†

Various earthy and metallic substances are found to enter into the composition of plants; and it is a matter of some doubt, whether these are formed *de novo* by the plant itself,

* Besides this vascular structure of the leaf which has been noticed, its bulk and colour are chiefly formed by a series of cells, supplied, probably, by a third and distinct termination of the vessels which perform the circulation of the crude sap.

† These annual depositions of ligneous matter are very conspicuous in the chesnut and other trees of rapid growth and porous structure. By counting those concentric circles in the stump or body of a tree, its age may be ascertained.

or are absorbed in an attenuated and liquid form from the air and soil.*

It was at one time supposed that growing plants gave out oxygen and absorbed carbonic acid, but as the latter is always necessary for the production of the former, and as the quantity of the oxygen gas produced is exactly equal to the quantity of carbonic acid gas that disappears, it seems that the oxygen gas is merely the result of the decomposition of carbonic acid. The experiments of Sir Humphrey Davy, however, seem to prove, that when plants are confined in an excess of carbonic acid gas, they possess the power of absorbing it to an unusual degree, rendering the air thus confined more pure than that of the external atmosphere. From the experiments of Sir Humphrey Davy and Mr. Ellis, it appears that growing plants universally and under all circumstances consume oxygen and produce carbonic acid gas; and that the bulk of the acid gas produced is exactly equal to that of the oxygen consumed. This seems to contradict the plausible theory entertained by modern philosophers, that the carbonic acid gas evolved by combustion and animal respiration, is consumed by the growing plants; and that the process of vegetation thus counteracts the adulterating effects upon the atmosphere of respiration and combustion.

It was observed by Sir Humphrey Davy, that in the dark no oxygen gas is produced by plants, whatever be the elastic medium to which they are exposed, and no carbonic acid

* From the following interesting account by M. Henri Bracconnot, (*Annales de Chemie, Fev. et Mars*, 1808,) we should be inclined to the presumption that plants possess the power of forming *de novo* the various earths and metals found in their composition.

Seeds of various plants were sown in pure river sand, in litharge, in flowers of sulphur, and even among metal, or common leaden shot; and in every instance nothing employed for their nourishment but distilled water. The plants throve, and passed through all the usual gradations of growth to perfect maturity. The author then proceeded to gather the entire produce, the roots, stems, leaves, pods, seeds, &c. These were accurately weighed, dried, and again weighed, then submitted to distillation, incineration, lixivation, and the other ordinary means useful in a careful analysis. Thus he obtained from these vegetables all the materials peculiar to each individual species, precisely as if it had been cultivated in a natural soil, viz. the various earths, the alkalies, acids, metals, carbon, sulphur, phosphorus, nitrogen, &c. He concludes this very important paper nearly in these extraordinary words: "Oxygen and hydrogen, with the assistance of solar light, appear to be the only elementary substances employed in the constitution of the whole universe; and Nature, in her simple progress, works the most infinitely diversified effects by the slightest modifications in the means she employs." See "*Recherches sur la force Assimilatrice dans les Vegetaux*, par M. Henri Braconnot," as quoted by Parkes. *Chem. Catechism*, p. 495.

gas is absorbed. In most instances, on the contrary, oxygen gas, if it be present, is absorbed, and carbonic acid gas is produced. "I once supposed," he adds, "that all the carbonic acid gas produced by plants in the night or shade, might be owing to the decay of some part of the leaf, or epidermis; but the recent experiments of Mr. Ellis are opposed to this idea; and I found that a perfectly healthy plant of celery, placed in a given portion of air, for a few hours only, occasioned a production of carbonic acid gas, and an absorption of oxygen." Mr. Davy thinks, however, that upon the whole, the balance is in favor of amelioration of the atmosphere from the process of vegetation. We know that most of the metals, and many of the earths, have a strong tendency to combine with carbonic acid: whether the consumption in this way is equivalent to its production by respiration and combustion, I do not feel myself authorized to determine, though the supposition appears probable. Be this as it may, carbonic acid gas is probably never, in any degree, the cause of endemic fever. The inhabitants of many cities are daily in the habit of taking large quantities of it into the stomach, in the different preparations of aerated or soda waters, without experiencing the least injurious effects. It is also exhibited with advantage in fever itself; and it has been found that in warm climates pestilential fevers abate during the vintage; which circumstance has been ascribed to the fermentation and consequent evolution of carbonic acid.

Though the decomposition of carbonic acid by growing plants, was the only or principal manner in which the prevention of an excessive accumulation of this gas could be accounted for, yet there may be some secret process, left for the discovery of some future philosopher, by which this circumstance may be satisfactorily explained.

It would seem, since water forms such an essential requisite in the growth of plants, that they possess the power of decomposing it, and of appropriating the hydrogen to their own nourishment and growth. This would appear more especially the case in aquatic plants, and the variety of sea weeds, which seem to draw their sustenance almost exclusively from the water alone. Besides, we know that plants, by their vegetation and decay, have the property of fertilizing the soil, and that plaster (gypsum) and other mineral substances act merely by increasing the power of absorption in the growing plants. Hydrogen, one of the elementary principles of water, forms a very important part of vegetable matter; it is by the combination and consolidation of this

element with the carbon of the atmosphere and a portion of the oxygen, that are formed the vegetable oils, wax, gums, resin, sugar, and finally the wood and solid fabric of the plant and tree; the residue of the unappropriated oxygen of the water is returned to the atmosphere to purify and enrich it. Plants, likewise, have been made to grow in sand, and after having come to maturity, the sand, upon being dried and weighed, was not found to have sustained any diminution; so that the substance of the plant must have been derived from the water with which it was nourished, and from the atmosphere.*

Whatever may be the function of the leaves, there can be no doubt that the principal part of the nourishment of vegetables is taken in by the root. The elastic matters that escape from animal and vegetable manures, principally consist of carbonic acid, hydro-carbonate and ammonia; and as vegetable substances are composed chiefly of hydrogen and carbon, the materials which furnish these elements are essentially conducive to fertility and vegetation. Nitrogen is also favorable to the growth of plants which grow and flourish freely in this gas. Since these substances are absorbed by growing plants from decomposing matter, whether these are taken in by the leaves or root, the effect in preventing the deleterious operation of noxious exhalations will be the same.

One striking peculiarity of hot and tropical climates is, the vast luxuriance of the vegetable world, and the countless myriads of animated beings. All nature teems with life. Wherever the land is fertile, but especially on the rivers and water courses, the oak, the poplar, the ash, the gum, the lynn, the sycamore, the hickory, &c. uniting their branches, make a dense shade, impenetrable to the noonday sun: in addition to which, the variety of vines, shrubbery and undergrowth, form a matted thicket, in many places almost impassable to the wild beasts which they shelter and protect. The plants of the season wither and die with the cold of winter, but no sooner does spring recal the warm and genial breezes of the south, than nature starts into renovated bloom and verdure: mounting the loftiest trees, the vines, which lately appeared like the ropes and cordage of a navy, soon cover the woods with their luxuri-

* In proof that fishes possess the same power of decomposing water and of applying it to their own nourishment, we read of a fish that was kept three years in a vessel of water, which element was its only food; the fish at last became too large to live any longer in the vessel. (*Rondelet de Piscibus*, lib. i. cap. 12.)

ant foliage; the lawns and opening vistas of the forest are closed and obstructed to the searching eye. A deep and melancholy gloom gives an aspect of solemnity and awe to the groves and uncultivated wilds. Not a foot of ground is left unoccupied, the spaces afforded by the larger trees are filled up by those of smaller growth; and vines, bushes, briars, weeds, and shrubbery of different descriptions contend for the remainder: to all which, add the swarms and multitudes of flies, musquetoes, bugs and smaller insects which find a continent in every leaf, lizards, reptiles, beasts, birds and smaller animals which seek the shady covert of the woods, and some idea may be conceived of the prolific nature of a southern clime.

It is to this luxuriance of vegetation and this countless number of insects and animated beings, which annually perish and decay, infecting the air with their morbific emanations, that we may ascribe, in a considerable degree, the origin and prevalence of endemic fevers.

The evening air, in this climate, in all damp and shady places, is generally impregnated with some palpable odour. The most disagreeable, is that of ponds and marshes, where the water has been recently dried up; the smell is old and musty, with a considerable degree of fœtor; the next in degree of strength, is the musky smell of the banks of small streams, reed brakes and wet places; the odour, though strong, is not unpleasant, except to those whose olfactories are very delicate; the scent approaches nearer to that of musk than any other. The next, and faintest in degree, is a peculiar aroma, as if composed of musk and spices; it is mostly perceived in the vallies of a sandy soil, upon a cool and still evening succeeding a hot day. Besides these odours there are others less frequently observed, which are more or less disagreeable, but which do not admit of a description. One remark which I would make is, that the unpleasant odours appear to be nearly allied to the agreeable in their proximate principles.

Upon the subject of decomposition as applicable to manures, Sir Humphrey Davy, in his lectures on agricultural chemistry, has some useful observations. "The doctrine of the proper application of manures from organized substances," says Sir Humphrey, "offers an illustration of the economy of nature, and of the happy order in which it is arranged. The death and decay of animal substances tend to resolve organized forms into chemical constituents, and the pernicious effluvia discharged in the process, seem to point out the propriety of burying them in the soil, where they

are fitted to become the food of vegetables. The fermentation and putrefaction of organized substances, in the free atmosphere, are noxious processes; beneath the surface of the ground they are salutary operations. In this case, the food of the plant is prepared where it can be used; and that which would offend the senses, and injure the health if exposed, is converted by gradual processes, into forms of beauty and usefulness: the fœtid gas is rendered a constituent of the aroma of flowers; and what might be poison, becomes nourishment to animals and to man."

It is thus that provision has been made for the regeneration of the fallen leaves, which lie scattered. and rot upon the ground, and which, to ordinary observation, would appear to be lost for ever. It appears from the experiment of Berthollet, whenever the soil becomes charged with the decaying and corruptible materials of animal and vegetable growth, the oxygen of the atmosphere combines with the mouldering mass, and converts it into carbonic acid gas, the food and nourishment of growing plants.

In this manner it is that, by the products of putrefaction, the animal and vegetable creations are renewed. Nothing is lost by death; it is but a change of condition, a transmutation of matter. From the mouldering ruins of departed life, a new growth arises into existence, with all the grace and beauty of renovated youth; and thus the metempsychosis of animal and vegetable beings, as likewise the ancient fable of the phenix emerging into life from her parental ashes, is chemically true.

Thus when a monarch or a mushroom dies,
Awhile extinct the organic matter lies;
But as a few short hours or years revolve,
Alchymic powers the changing mass dissolve;
Emerging matter from the grave returns,
Feels new desires, with new sensation burns;
With youth's first bloom a finer sense acquires,
And Loves and Pleasures fan the rising fires.

DARWIN.

Organic forms with chemic changes strive
Live but to die, and die but to revive;
Immortal matter braves the transient storm,
Mounts from the wreck, unchanging but in form.

SECTION 5.

Of Heat and Moisture.

Some physicians, overlooking the more immediate causes of diseases, have entertained the idea that the heat of summer in hot and tropical climates, was alone concerned in the production of endemic fever. Whereas the only influence which the heat of climate and season can have upon the constitution, in aiding the influence of miasmata, is to produce debility, thereby rendering the body more susceptible of disease; or, in other words, acting as the predisposing cause of fever. "The heat of tropical climates," says Dr. Hunter, "though generally represented as the cause of their unhealthiness, will not alone produce fevers, as is strikingly exemplified in those living on board of ships, who remain free from fevers; and also, the inhabitants of dry sandy spots along the coast, in which the heat is unusually great, yet the situations are healthy, as Fort Augusta, Port Royal, and others."* In order to produce endemic fever, it is necessary that the heat should have corruptible matter to act upon, and that this corruptible matter be in a state of humidity. "It is commonly asserted," says Assalini,† "that the heat, in Egypt, puts a stop to the plague, whilst it makes it break out in Constantinople. How is this fact," continues he, "to be accounted for? The explanation, in my opinion, is very simple. At Constantinople, the exhalations from various bodies, in a state of putrefaction, are very copious during summer; the cold of winter prevents their formation, and the disease ceases. In Egypt, on the contrary, the action of the sun is very powerful, even during winter, and gives rise to noxious exhalations. When the low grounds have become dry, which happens in the month of Nisidor, (in June, at the festival of St. John) then the coast of Lower Egypt becomes as healthy as the rest of that fine country."

It is remarked by the natives on the coast of Coromandel, and the observation is confirmed by the experience of many Europeans, that the longer the hot land winds continue to blow, the healthier are the succeeding months; agreeably to their opinion, these winds purify the air. The inquiry is made by Dr. Lind, whether these winds are not the cause why the air on the coast of Coromandel, except during their

* Diseases of Jamaica, p. 16.

† Assalini on the Plague, American Edition, p. 72.

continuance, is more healthy than in other parts of India, where these winds do not blow; and whether this does not suggest a very probable reason why the plague in Egypt generally ceases in the beginning of June: the periodical hot winds that come from the deserts of Nubia and Ethiopia, having then rendered the air in Egypt pure and wholesome.* This effect of the hot wind seems to be owing to the sudden and rapid exsiccation which it occasions, depriving the decaying remains of animal and vegetable matter of their moisture, and thereby suspending the process of putrefaction: another, and perhaps considerable effect, seems to be its power of rarifying, by the degree of heat which accompanies it, the noxious miasmata themselves.†

The fact of the hot winds, as they are properly called, putting a stop to the plague in Egypt, is confirmed by the generality of travellers, who have made observations upon the subject.‡ After the 24th of June, the plague, however great may have been its ravages, ceases in Egypt. After that day, there is seldom an instance of any person being attacked by that disorder. Some have attributed this to the overflowing of the Nile, others to the prevalence of the north wind; but it is pretty clearly ascertained, that the plague generally ceases before any increase of the Nile is perceptible, and before the commencement of the north wind. And Mr. Antes has shown from authentic facts, that any extraordinary degree of heat, even at an earlier season, produces a similar effect.

Different from this, however, is a hot, close, stagnating air, not agitated or refreshed by breezes and gusts of wind; and which, by debilitating and relaxing the system, must act as a predisposing cause, and by favoring the accumulation of infectious miasmata, must contribute to increase the vitiated state of the atmosphere: for where the putrefaction is of a local nature, a strong breeze, by displacing and removing the infected atmosphere, for a time renders it healthy, until again corrupted by the original source of decomposition.

Hippocrates, in describing a pestilential fever, says the year in which it prevailed, was without a breeze. A similar state of the atmosphere existed during the prevalence of the plague in London in 1665. We are informed that du-

* Lind on the Diseases of Hot Climates, p. 47.

† The injurious and sickening effect of this wind, during its continuance, is to be attributed to the circumstances already mentioned, its constricting the skin, and checking perspiration.

‡ Antes' Observations, p. 45. Brown's Travels, p. 369.

ring a plague at Vienna, the wind did not blow for three months; at the end of this time, a breeze arose, by which the distemper was evidently alleviated.* We are told by Dr. Clark, that sailors become sickly after long calms in East India voyages. Sir John Pringle observes, that "when the heats come on soon, and continue throughout autumn, not moderated by winds or rains, the season proves sickly, distempers appear early, and are dangerous. This hot, stagnating and oppressive state of the atmosphere, is also taken notice of by Dr. Rush, as attending the mortality of the yellow fever in Philadelphia in 1793.

Gusts of wind and showers of rain have considerable influence in purifying the atmosphere, by precipitating and dispersing the noxious miasmata, and thereby giving a check to the rise and prevalence of disease. This was particularly remarkable in different parts of Alabama, in the summer of 1823. There were but very few days successively, in which there were not one or two copious showers of rain, accompanied with loud peals of thunder, and heavy gusts of wind. The extinct relics of animal and vegetable growth had scarcely time to commence decomposition before they were swept away by a flood of rain, and the noxious miasmata attaching themselves to the drops and particles of water, were carried off in the common deluge. Sometimes, for three or four days successively, the face of the sun would be scarcely visible for a moment. The Alabama river was almost constantly swollen, and had a depth of water sufficient for the largest steam-boats; a thing unusual at that season of the year. The consequence was, that the summer and autumn proved remarkably healthy. Dr. Rush, on the subject of the yellow fever of 1795, observes, that "On the 30th and 31st of August, there was a fall of rain, which suddenly checked the fever of the season, insomuch, that the succeeding autumnal months were uncommonly healthy."† The same thing took place in the fever of 1796, in consequence of the rain which fell about the middle of July, so that August, September and October, were nearly exempt from disease.‡

It appears from the register of interments in the Friends' burying ground, that the yellow fever which raged in Philadelphia in 1699, and which is taken notice of in the Journal of Thomas Story, ceased about the latter end of October,

* Van Swieten's Comment.
† Inquiries and Observations, Vol. III, p. 448.
‡ Ibid.

or the beginning of November. The same disease was checked by wet and cold weather in the year 1741.

As to the degree of temperature necessary to the origin and prevalence of the bilious endemic or yellow fever, the following facts are adduced in illustration.

Dr. Le Blond, in his observations on the yellow fever, as it fell under his notice in America, between the 15° of north, and the 15° of south latitude, represents the temperature of the hot or low country, situated near the sea-coast, as being in the day marked from 82, to 100, of Fahrenheit, and in the night from 73 to 68.

Dr. George Davidson, in his observations on the yellow fever of Fort Royal, Martinique, informs us, that towards the latter end of June, the thermometer, in the shade, stood for several days at 90° of Fahrenheit, at 2, P. M.; which proved a prelude to the appearance of the disease. "I have no doubt," says he, "when the mercury stands at 86°, or above that for several days, the weather being at the same time calm, that exhalations from swamps, and miasmata from putrid vegetable and animal matter, chiefly, are capable of producing the disease."*

Dr. Richard Bailey, on the subject of the yellow fever of New-York, in the years 1796, '97, and '98, gives the following thermometrical statement of the weather.†

On the 8th of August, 1798, the mercury in Fahrenheit's thermometer, at an elevation of forty feet above the ground and in the shade, at 2, P. M. stood at 91°.

On the 9th,	96°,	On the 12th,	86°,
10th,	90,	13th,	83.
11th,	89,		

The highest to which the mercury rose in

July, 1795, was	83°,	July, 1797, was	90°,
August,	95,	August,	82,
July, 1796,	88,	July, 1798,	94,
August,	89,	August,	96

After the immense fall of rain on the 14th of August, 1798, which filled many cellars in the lower parts of the city, and occasioned a quantity of standing water, the thermometer, which had fallen on that day to 78, rose on the

15th, to	82,	17th, to	90,
16th,	85,	18th,	90.

* Letter from Dr. Geo Davidson, dated Fort Royal, Martinique, Sept. 20, 1796, to James Mease, M D. resident physician of the port of Philadelphia. Med. Repos. Vol. I. p. 157.

† See Med. Repos Vol. II. p. 285.

This sudden and great increase of heat, our author informs us, immediately after the violent rain, appeared to have a proportionate influence in producing fever; and that from this period, the disease became more general. The greater fatality of the fever in 1798, Dr. Bailey ascribes to the greater degree of heat, moisture, and corruptible materials; and the fever was particularly severe in Cliff street, Catherine slip, Water street, Burling and Beekman slips, where, in addition to the offensive accumulations of offals, garbage, the refuse of vessels, kitchens, and other impurities deposited in the slips and gutters, there was an enormous quantity of spoiled beef, fish, and other articles of a perishable nature, the stench from which was extremely offensive. During the prevalence of an easterly wind, and after its continuance for forty-eight hours, there was scarcely a house in Pearl street, near where the spoiled provisions were stored, in the lower end of John street, and in Cliff street, which was not visited by the fever.

The bilious or yellow fever prevailed in Boston, from the 18th of June, 1798, to the 29th of October.* The disease prevailed principally in the neighborhood of filthy and offensive docks, sewers, and confined narrow, dirty lanes, and in the vicinity of a mill pond, the receptacle and deposit of all manner of filth, as dead dogs, cats, putrid meat, fish, and rotten vegetables.

The thermometer in June ranged for twenty days from 70 to 83, and nine days from 69 to 70. The diseases this month were fevers, pleurisy, bilious and inflammatory fevers, opthalmia, and a few cases of cynanche parotidea.

During the month of July, the range of the thermometer was from 72 to 96, excepting three days, when it descended to 67. The diseases this month were the typhus gravior, and in some instances the yellow fever.

In the month of August, the mercury fluctuated between 72 and 94, except on the 20th and 23d, when it fell to 69 and 67.

During the month of September, the thermometer varied from 56 to 77. On the 29th, there was a frost; and the fever abated towards the latter end of the month.

In the month of October, the thermometer ranged from 36 to 56. For thirteen days, the wind was from the N. W.; for the remainder of the month, it was variable from N. E. to S. E. On the 7th, there was a great storm, with much

* See an account of the epidemic prevalent in Boston, by Isaac Rand. Med. Repos. Vol. II.

rain. A severe frost happened on the 29th, when the further progress of the fever was arrested.

The remitting, bilious, or yellow fever, which prevailed at Wilmington, (Del.) in the summer and autumn of 1800, was preceded by cynanche maligna, parotidea, and by diarrhœas, choleras, and dysenteries. There was a great tendency to inflammatory affections, especially in cases of local injuries which were liable to run into gangrene. During the month of July, the thermometer ranged from 85 to 91°, with occasional thunder gusts throughout the month.

During the month of August, the thermometer ranged from 73 to 85, and on the first of the month the mercury stood at 91°.*

We are informed by Drs. Selden and Whitfield, that during the prevalence of the yellow or bilious fever in Norfolk, (Va.) in 1800, after the 25th of June, the inhabitants for two months lived in an atmosphere heated above the 85° of Fahrenheit's thermometer, sometimes to 94 or 95, and very frequently upwards of 90. The rains had been very frequent in June and July; but instead of cooling the atmosphere, it was observed that they were followed by more intense heat. The disease disappeared towards the latter end of October, upon the setting in of cool weather.†

Providence, (R. I.) was visited by the yellow fever in the years 1797, 1800, and 1805. The disease appeared in the most confined, warmest, and most filthy parts of the town; in the south part of Water street, and the lanes and alleys adjacent, opening to the wharves, which are filled in with earth, logs, oyster shells, &c. having vacuities through which the tide ebbs and flows. The docks are very flat, and are left partially bare at low water. The yellow fever made its appearance there in 1797, on the 13th of August; in the first part of this month, damp easterly weather had been succeeded by a sudden transition of heat, when the thermometer, in an airy situation, ranged from 86 to 91 of Fahrenheit.‡

The bilious remitting fever prevailed in Savannah in 1805, as it has on several other occasions, and carried off 175 white persons, out of a population of little more than 2,000. According to Dr. White, the following were the state of the thermometer and weather this season.

* See an Account of the Diseases at Wilmington, (Del) in the Summer and Autumn of 1800, by Dr. John Vaughan.

† Med Repos. Vol IV. p. 329.

‡ Wheaton's Account of the Yellow Fever in Providence. Med. Rep. Vol. X. p. 329.

June was cool, with much rain. Three days the mercury rose to 90 and 91°: for the rest, it varied from 77 to 82°, during the heat of the day.

July was hot and dry. The mercury rose to 93 twice, once to 92, and three times to 91.

In August, two days the mercury rose to 90 and 91, for the rest from 81 to 90, at the hottest period of the twenty-four hours. Eighteen days were more or less rainy.

September was cooler than usual for the climate. On the 14th, the mercury was at 88° at 3, P. M. During the rest of the month, it ranged between 72 and 85. Twelve days were rainy.

The sickness arrived at its height in September, declined in October, and disappeared in November.*

Don Armasto wrote an eloquent and interesting pamphlet on the plague or bilious fever of Cadiz in 1800. With this pamphlet I have merely obtained a slight acquaintance, through the medium of the Medical Repository. In the review, one of the most material parts of the work, the meteorological observations are omitted. We are told, however, that the weather was unusually hot during this sickly period, and that the thermometer rose to 95°, a degree of heat unusual in those latitudes, equal to that of Senegal, and greater than that of the equatorial continent of America. In the rays of the sun, and in damp places, the mercury often rose to 112°. The winter rains having been protracted one month later during the spring, the moisture was as excessive as it ever has been observed in countries subject to pestilence. In fine, forty days of the most distressing easterly wind, highly predisposed every living body to disease.†

Dr. Joseph Johnson, in his account of the diseases of Charleston in 1793, makes the following observations upon the weather which ushered in and attended the bilious remitting or yellow fever of that season, after remarking that the approach of summer was as rapid as the spring had been backward, he observes, "The 11th of June was one of the hottest days to which our climate is subject; the thermometer standing at 92°, in a very cool situation, and at 94° generally through the city. The average heat of July was 86°; a range considerably higher than had been observed since 1796, and somewhat exceeded the great heat of that year. From the 26th of July to the 18th of August, there had been but one shower; the heat being steady and considerable, the

* Med. Repos Vol. II. p. 12.
† Ibid, Vol. XI. p. 137.

endemial causus commenced about the latter date, and was aggravated by the extremely hot weather, from the first to the fifth of September, when the thermometer, at noon, in the coolest situation, varied from 90° to 92½. September was, from sickness and death, the blackest month ever recorded in Charleston, there having been 328 interments, of which 114 were from endemial causus; and at least one fourth of the inhabitants were affected with the influenza about the last of the month." The remainder of the season was remarkable for the severity of the drought, so that many cattle died for want of water, and travellers could not obtain a sufficiency near the roads, either for themselves or their horses.*

Dr. Caldwell, in his essay on the yellow fever of Philadelphia in 1805, by a reference to a journal of the weather, kept for several years in that city, proves the coincidence between hot summers and the prevalence of the yellow fever.

Dr. Frost, in his account of the death of Dr. Valli, of yellow fever, at Havana,† in September, 1816, observes, that the thermometer ranged in the day from 81 to 85 of Fahrenheit, and never below 81, even at night.

A malignant bilious fever appeared in July, in Winchester, Virginia,‡ in 1804. We have no regular register of the weather, but are told, that from the 15th of May nearly to July, there was more or less rain every day, with wind mostly from the S. E.; the mercury in Fahrenheit's thermometer ranging from 66 to 84 and 86. From the beginning of July to the 13th, the weather was very warm, with occasional heavy showers; but from the 15th to the 22d, the weather was fair, and extremely hot, the mercury rising to 94 and 96.

In the island of Jamaica, the heat at Kingston throughout the year varies from 70 to 80° of Fahrenheit. In ascending towards the mountains, the temperature quickly alters

* Med. Repos. Vol. XI. p. 402. From 1700 to 1748, the yellow fever raged at five different periods in Charleston. For forty-four years after that period, there was no epidemic prevalence of the disease, though it appeared in different summers in a few sporadic cases. A new era of this fever commenced in the year 1792. It raged in Charleston in that year, and in 1794, '95, '96, '97, '99, 1800, '1, '2, '4 and 7. The number of victims in the most fatal years, were, in 1799, 239; in 1800, 134; in 1802, 96; in 1804, 148; in 1807, 162; in 1793, 98. It prevails from July to November, but is most epidemic in August and September.

† Ibid, Vol. VIII. p. 252. Winchester is situated in 39° N. Lat.

‡ Ibid, Vol. XVIII. p. 369.

with the elevation; eight miles from Kingston the maximum is only 70; at the distance of four miles from this town, where the elevation is 4200 feet, the average range of the thermometer is from 47 at sun-rise, to 58 at noon; and the minimum in winter is 42.*

In the island of Java, from the month of July to November, the thermometer on the coast generally ranges between 80 and 90 during the hottest time of the day; and during the coolest part of the morning, is seldom lower than 88. In ascending towards the high grounds, the warmth of the atmosphere gradually diminishes from 85°, the ordinary heat in the plain, to 50°, the temperature experienced on the summit of the mountains, which are even occasionally covered with snow. In the highest parts that are cultivated, the heat during the day is from 60 to 65°, and at night as low as 54°. The climate on the coast, and especially at Bantam, is more pernicious to the health of Europeans than that of any other country where settlements have been formed.—Of persons newly arrived, the usual calculation is, that three in five will die the first year, and of the survivors from nine to twelve in the hundred, annually; exclusive of the troops and seamen, among whom, in consequence of their irregularities, the mortality is truly deplorable.†

In India, the temperature of the coast of Coromandel is generally much higher than that of the provinces on the coast of Malabar; and the Carnatic and the north west extremity of the northern Circars are deemed the hottest, not only on the Coromandel coast, but in all India. In the latter district, the French, in the year 1757, lost seven European soldiers in the course of a single day by *coup de soliel.* Along the sandy and almost dry bed of the Krishnah, the temperature is most oppressive; the thermometer being sometimes raised, near the mouth of that river, to 110° for several days, even in the house, and seldom falling under 105. In the low country of the Arcot district of Carnatic, during the hot season, the thermometer, under the corner of a tent, rises to 100°, and, when exposed to the sun, to 120°. Taking the average of the whole year, the heat of Madras is less than that of Calcutta. In January, the thermometer is about 70°; this is the lowest temperature: the highest is in July, when the thermometer is about 91°.‡

* Edinb. Encyclop. Art. *Jamaica.*

† Ibid, Art. *Java.*

‡ Ibid, Art. *India.*

The following state of the thermometer was observed in 1801, in Demarara, by Dr. Chisholm,* where the yellow fever generally prevails. In January, it ranged from 82 to 84°. In February, from 76 to 83. In March, from 80 to 86. In July, from 80 to 87. In August, from 78 to 80. In September and October, from 86 to 88.

In South Carolina, from 1791 to 1808, the difference between the coolest and the warmest summers, was from 88 to 93°, and the difference between the mildest and the coldest winters, on a few particular days, from 50 to 17°. In Charleston and the low country, the heat is more moderate than in the interior parts of the state. At Columbia, in the summer of 1808, the mercury in the thermometer frequently rose to 96, 97, and sometimes to 98, whilst at Charleston it did not exceed 91°. The medium temperature of well water in Charleston is 65°, twelve degrees above that of well water in Philadelphia.

It is remarked by Dr. Blain, that in order to produce yellow fever, there must be, for a length of time, a heat seldom falling below 75° of Fahrenheit's thermometer.†

From the result of observations upon the degrees of heat in Philadelphia in June and July, between the years 1793 and 1809, collected and published by Mr. Evans, in the True American, of the 2d of August of 1809, it appears, that the yellow fever has never been epidemic in Philadelphia, when the medium heat of June and July was below 79°, except in 1802, when it was 78, and in which year not more than two hundred persons were supposed to have died of it. Though fevers of inferior grades prevailed at a lower temperature.‡

From all that has been advanced in relation to this subject, I think it will appear that a range of temperature from 70 to 86 of Fahrenheit is necessary to the production of the bilious endemic, or yellow fever; that the temperature should not fall much, if any, short of 70 at night, nor of 86 in the heat of the day. But it may be remarked, that the higher the natural temperature of the atmosphere, provided it is not sufficient to dissipate moisture, the greater the putrefaction, and the more sickly the season; always bearing in mind, however, that a greater degree of heat will compensate for a deficiency of corruptible materials, and an ex-

* See Edinb. Encyclop. Art. *Cotton.*

† Diseases of Seamen, p. 425.

‡ See Rush's Inq. and Obs. Vol. IV. p. 166.

cess and abundance of the latter will be equivalent to a greater degree of the former.

As to moisture, its only effect upon the body, when externally applied, seems to be that of aiding the operation of cold in stopping the pores of the skin, thereby checking perspiration, and suspending the excretion of offensive matters from the mass of blood. It would be trifling and absurd to attribute to it any directly deleterious property; since moisture, in the form of water, is one of the most essential requisites of life, as well in the animal as in the vegetable kingdom. We daily consume, without the least apprehension, a large quantity of this article; and so far from producing disease, it is one of the most necessary preservatives of health, without which, man soon sickens, languishes and dies. "Simple moisture alone," says Dr. Hunter, "is harmless, at least as far as relates to the production of fevers, of which Fort Augusta and Port Royal may be given as examples, for they are nearly surrounded with water on all sides."*

That it is the miasmata, and not the moisture of particular situations, as some have contended, which occasion fever, we have shown from the observations of Dr. Lind, confirmed by those of other physicians, that ships lying at anchor at a considerable distance from a sandy shore though enveloped in fog, escape intermittents; whilst others lying near are subject to them.

Dr. Franklin, in a letter to Dr. Percival, makes the following sensible observations: "The gentry of England," says the Doctor, "are remarkably afraid of moisture and of air. But seamen who live in perfectly moist air, are always healthy if they have good provisions. The inhabitants of Bermudas, St. Helena, and other islands, far from continents, surrounded with rocks, against which the waves continually dashing fill the air with spray and vapour, and where no wind can arise that does not pass over much sea, and of course brings much moisture, are remarkably healthy. And I have long thought that mere moist air has no ill effect on the constitution; though air impregnated with vapor from putrid marshes is found pernicious, not from its moisture but putridity. It seems strange that a man, whose body is composed in a great part of moist fluids, whose blood and juices are so watery, who can swallow quantities of water and small beer daily without inconvenience, should fancy

* Diseases of Jamaica. See also the Med. Transactions, vol. viii. p. 521; for a confirmation of the same opinion.

that a little more or less moisture in the air should be of such importance."*

If moisture alone were capable of producing fever, sailors and sea-faring people would be peculiarly subject to it; for at sea the evaporation is very great, and the air is constantly charged with moisture, so that cotton bales and other articles soon acquire a considerable increase of weight; yet provided the provisions are wholesome, and the vessel is kept clean and sweet, no situation is more healthy.

We have already noticed the necessity of moisture as a means and requisite of putrefaction; to this purpose, we are informed by Dr. Hunter† that the dry part of the country in the island of Jamaica continues healthy during the hot weather, but as soon as the rain sets in, it becomes unhealthy. After heavy falls of rain, every part of the flat country seems to exhale the same noxious vapors as marshes, for the moisture never fails to meet with a sufficient quantity of decayed vegetable or animal matter.‡

It was well observed by Sir John Pringle, that wherever the greatest cause of moisture and putrefaction in the air exists, there also will be the greatest number and worst kinds of intermitting and remitting fevers. The same author, speaking of the diseases of the West Indies, observes, that fevers of the intermitting and remitting forms, with bilious vomitings, become frequent in June and July, and epidemic in August, September and October, which are there, at least in Jamaica, the three most rainy months in the year. "These fevers," says he, "are incidental to natives as well as to strangers. But new comers are liable to a different species, at least to a different degree of the same disease, a more rapid, a more putrid, and a more dangerous fever, distinguished by black vomiting, but chiefly by the yellowness of the skin, which gives it the name of the yellow fever."§

Dr. Rogers, in his account of the epidemic diseases of Cork, says, that during the particular series of years that

* Percival's Essays, Med. and Experimental, vol. iii. p. 37–8.

† Diseases of Jamaica, p. 18.

‡ The pernicious effects of excessive moisture or wet weather, in giving rise to diseases of a malignant character, was remarked by Hippocrates, who says that continual showers give rise to severe diseases, with fevers of long continuance, then fluxes of a putrid nature, &c. Per assiduos imbres morbi magni exparte oriuntur, tum febres longæ, tum albi fluxiones, putridines, comitiales, apoplexia et anginae. Aph. 16, lib. iii. sec. 3.

§ Diseases of the Army, p. 193.

epidemics were most prevalent, the several seasons were remarkable for warmth and moisture.*

In dry sandy spots nearly surrounded by the sea, where there is little or no decaying vegetable or animal matter, and where the moisture is immediately absorbed by the sand, fevers scarcely ever appear.

It is observed by Dr. Lind,† that the large rivers in dry seasons being confined within narrow bounds, leave a large part of their channels uncovered, which having the moisture totally exhaled becomes a solid hard crust; that when the rains fall, this long parched crust of earth and clay gradually softens, and the ground, which before had not the least smell, begins to emit a stench, which in four or five weeks becomes exceedingly noisome; and at this time their sickness is most violent. The same author further informs us, that he was told by a surgeon who had practised some years at Senegal, that for several months during the dry season, the country was as healthy and as pleasant as any in the world, but soon after the rainy season began, a low malignant fever constantly spread itself among the Europeans. It was remarkable, says this author, one year at Senegal, that at the beginning of the rainy season, in the night succeeding one of those tornadoes, a great number of soldiers and two thirds of the English women were taken ill, this garrison having before been uncommonly healthy.

The memorable destruction of Admiral Horner's squadron, at the Bastimentos, was begun by the scurvy, and completed by the malignant fever and flux. In the year 1741, no sooner had the rainy season set in at Carthagena, where the English troops lay encamped, than the same disease appeared and was remarkably malignant, became contagious, and destroyed the greatest part of the army.

A prevailing opinion is, that the healthiness or unhealthiness of any place depends, very essentially, upon the quality of the water which the country affords. What has given greater currency to this idea is, probably, the circumstance of bad water and bad health being frequently found concomitants of each other. Thus in low, level, wet, and marshy situations, the water, from stagnation, and from being impregnated with the decaying vegetable matter, is generally mawkish and disagreeable. In such places, also, intermitting and bilious fevers are apt to prevail; hence the bad quality of the water and the prevalence of the fever have

* Rogers on the Epidemic Fevers of Cork, p. 25.

† On the Diseases incident to Europeans in Hot Climates, p. 52.

been considered as causes and effects. On the other hand, we find that sandy, poor, hilly, dry, and elevated countries, far from marshes and stagnating ponds, are generally healthy; here, likewise, the water is pleasant, cool, and well tasted: this has been considered as another argument in favor of the salutary influence of good water as a preservative against disease. As the premises, however, are erroneous, the inferences which have been drawn in these instances must, unquestionably, be equally untrue. And in many parts of the country adjacent to the rivers, where springs of cool and limpid water issue from the pure sand and gravel of the bank, we find the people in such situations equally subject to fevers as those who live in places of a different description. It is, indeed, a fact of general notoriety, that, in the state of Alabama, the water which issues from the banks and bluffs of the rivers is of an excellent quality, whilst at the same time it is equally well known that the vicinity of rivers and creeks is peculiarly unfavorable to health.

From these considerations, we are led to conclude that the quality of the water has but little influence in the production of endemic fever; otherwise we should find this disease less under the influence of the seasons, and that persons continuing to drink from the same fountain, if this were the prime agent, would be subject to a perpetuity of disease through the winter as well as the summer, in situations where endemic fevers were apt to prevail. It frequently happens at sea, that the ships' companies are obliged to make use of corrupt and stinking water, yet when their situation is otherwise comfortable, no injurious consequences ever happen from the circumstance.

Although the quality of the water has much less influence upon the healthiness or unhealthiness of the place than has been generally supposed, yet it is not contended that impure, stagnant and offensive water is absolutely harmless. A great quantity of fluid is consumed in the course of the summer; and although the stomach has the power of changing and correcting, to a certain degree, the offensive qualities of substances received into it, yet this power itself is limited; hence, when the water is very impure and offensive, and drunk in considerable quantity, it may aid the other remote causes of fever, or give rise to affections of the bowels in the form of dysentery and diarrhœa. But waters, by use, may become wholesome and agreeable, which, in strangers to their use, at first occasion sickness and diarrhœa. This is owing to their saline, mineral, and earthy impregnations, and frequently takes place in what are called lime-stone

countries. But such impregnations are different from the offensive impurities of stagnation, and are calculated rather to prove serviceable than otherwise, especially to invalids, and persons subject to constipation and visceral obstructions.

It is well known that the French are particularly partial to meats and wild game in a semi-putrid and offensive condition, the fumes of which would occasion sickness and vomiting in a person unaccustomed to their use; yet the quantity of vegetables which they use at the same time, and their light ascescent wines, counteract any injurious effects that might arise from this putrescent quality of their viands: but if men were compelled to drink water in a condition equally offensive, it would probably be considered as an intolerable hardship, and the sure occasion of disease. I merely mention this circumstance for the purpose of showing that more stress is laid upon water in the production of disease, than in truth and justice should really fall to its share.

Fresh rain water, as being more free from every earthy, saline, and hurtful impregnation, is, unquestionably, the most wholesome water that can be made use of as a common drink. "Rain water," says Hippocrates, "is the lightest, the sweetest, the finest and most limpid."*

The subject of moisture will again fall under consideration, when we come to speak of the predisposing and exciting causes of fever.

SECTION 5.

Of Miasmatic Exhalations.

The noxious influence of marshy exhalations in the production of malignant fevers, was noticed by Galen;† but the power of marsh miasmata in giving rise to intermitting and remitting fevers, was first more particularly observed by Lancisi, the Pope's physician, about the middle of the seventeenth century; since which time, the truth and justice of his observations have been confirmed by the extensive experience of numerous physicians in various quarters of the world. As this is a subject of interest and importance to

* Aquæ igitur ex imbubus collectae, levissimae sunt tenuissimae et limpidissimae. De Aer Loc. et Aq. Opr. Om. p. 285.

† De Feb. Differ. lib. i. cap. 2.

the community at large, as well as to the physician, it may be of consequence to illustrate the matter by examples drawn from competent and respectable authority.

From the remarks already made upon the influence of heat and moisture, it will be readily understood, that the circumstances most favorable to decomposition, the extrication of miasmata and the consequent production of fever, will take place, where, *ceteris paribus*, the action of the sun is the most powerful, as in equatorial latitudes, the tropical and neighboring climates. We have already noticed the apparent identity of the cause of fever, and the principle of vegetation, as occurring in marshy places and in warm climates during the summer season.

In a previous work* I have given my opinion that the intermitting, the remitting, the yellow fever and plague, are only gradations and modifications of the same disease; that they all arise from the same causes, differing only in degree of force and concentration, and that the proximate cause of each is the same. In illustration of which, I noticed the circumstance of the intermitting, the remitting, and the yellow fever prevailing at the same time and place, and changing and interchanging their forms with each other; that which is at one time an intermitting, suddenly assuming the character of the bilious or yellow fever; and on the contrary, the latter divesting itself of its malignancy, and taking on the livery and characteristics of intermitting fever.

These different forms of fever are the prevailing diseases in the southern portion of the United States, wherever marshes, ponds of stagnating water and corruptible materials are exposed to the influence of a powerful sun. From what I can learn, however, I feel authorized in contradicting the report of Dr. Jackson, that there is not on record an instance of a person born in Petersburgh, Virginia, and constantly residing in the same place, who has lived to the age of twenty-one. When at Petersburgh, in 1813, I saw no particular marks of unhealthiness, the men appeared as stout, active, and of as healthy a complexion as they are generally found in any part of the southern country. It may, however, be laid down as a position, that instances of longevity are fewer in proportion in the southern states than in those of more northern latitudes. The stimulating and relaxing influence of a warm climate, unwholesome exhalations and frequent attacks of disease, appear to be the causes of the early decay of the corporeal powers and vital

* On the Topography and Diseases of Louisiana.

principle in man: yet even in New-Orleans there are found many instances of residents who have attained to honorable old age by temperance and regularity of life.

Galen assigns two causes for pestilential fevers: First, the great heat of the weather, when the humors happen to be in a more putrescent state than usual; second, and more frequently, a putrescent state of the air arising from a multitude of dead bodies left unburied, as after battle, or from the evaporation of corrupted lakes and marshes.

The noxious effects of marshy exhalations take place in Egypt after the Nile retires within its banks, leaving the wet ground covered with a variety of putrefying animal and vegetable substances.

We are informed by Mr. Ives, who travelled from India to Europe by land, that at Bagdad, a city containing 500,000 souls, the Arabs are in the habit of taking revenge for any injury done them by the Turks in Bassora, by breaking down the banks of the river near this place, in consequence of which, a dreadful sickness and mortality are produced. This was the case in 1743, when the Arabs, by demolishing the banks of the river, laid the environs of Bassora under water. The stagnating and putrefying water in the adjacent country, and the great quantity of dead and corrupted fish at that time lying upon the shore, polluted the whole atmosphere, and produced a putrid and most mortal fever: of this fever, between twelve and fourteen thousand of the inhabitants died, and at the same time not above two or three of the Europeans who were settled there, escaped with life.

Mr. Macgregor, in his medical sketches of the expedition to Egypt from India, says, one of the principal sources of disease in Egypt, is unquestionably the annual overflowing of the Nile; on the subsiding of which, the soil, through a great extent of country, is covered with mud and putrid exuviæ, which exhale effluvia noxious to the human body.—If we add to this, "says he," the extreme filth of the inhabitants, poor diet, close and ill ventilated apartments, much crowded narrow streets, and the bad police of the towns, we will not be astonished if a fever, at first intermittent, or remittent, should have symptoms denominated malignant superadded to the more ordinary symptoms of the disease.*

During the summer of 1813, the United States brig Louisiana, stationed at Fort St. Philips, on the Mississippi, lost nearly the whole of her crew by the bilious or yellow fever. The country at this place is an entire swamp, and as the ri-

*Duncan's Annals of Medicine, vo. 8, p. 264.

ver is too deep to admit of anchoring in the middle of the stream, the vessel was confined to the bank, so that the men were immediately exposed to the noxious exhalations of the adjoining morass.

"If any doubt, says Dr. Hunter,"* can be entertained that the exhalations from wet and marshy grounds, are the cause of fevers in Jamaica, attending to the following facts cannot fail to remove them. Ships lying at Port Royal with their men in perfect health, have in a few days become sickly. The men have been seized with fevers, owing to the low swampy land along shore, and at the head of the harbour, from which last the exhalations are carried every morning towards the ships, when the regular sea breeze sets in, as is sensibly perceived by the bad smell which accompanies it."

I have remarked in my *Observations on the Topography and Diseases of Louisiana*, that heat and moisture, by mutual co-operation, cause sickness to prevail with the greatest mortality in the months of June and July. Local circumstances, however, may prevent and vary this effect; as at New Orleans, where sickness is most prevalent and malignant in August. This is owing to the number of ponds lying in the rear and vicinity of that city, which being filled with water through the early part of the season, decomposition is thereby prevented from taking place to any considerable degree in the morass beneath, till the exsiccation of the water is in a great measure effected by the falling of the river and the continuance of heat.

From the same circumstance it happens that a rainy season renders the city of New Orleans healthy, by keeping the ponds filled with water, whilst it has a contrary effect upon the country generally. In illustration of this circumstance, in the work above referred to, I called the attention of the classic reader to the recollection of the instance related in the history of Empedocles, the Sicilian philosopher and poet, who put a stop to pestilential diseases among the Salacenti, by turning two streams of good water into the morass from which they originated. Dr. Dazilles, in his treatise upon the diseases of the negroes in the West Indies, informs us, that the rainy season is the most healthy at Cayenne, owing to the neighboring morasses being deeply overflowed. It is well known that the overflowing of the Nile puts a stop to the plague in Egypt, by covering the low grounds, and preventing the progress of putrefaction in the alluvial mat-

*Observations on the Diseases of the Army in Jamaica, p. 29.

ters which lie upon the surface of the earth. The letting out of the water from the fosses of fortified towns, has produced malignant remittents, and the letting it in again has put a stop to their progress. Sir John Pringle speaking of the diseases of Flanders, where, from the low damp situation, intermittent fever is the prevailing complaint, observes that when the heat comes on soon and continues throughout autumn, not moderated by winds and rains, the season proves sickly, the distempers come on early, and are dangerous; but when the summer is late, and tempered by frequent showers and winds, or if the autumnal cold begins early, the diseases are few, their symptoms mild, and their cure easy. For in marshy grounds, intense and continued heats, even without rain, occasion much moisture by the exhalation which they raise and support in the atmosphere; whereas frequent showers during the hot season cool the air, check the rise of vapours, dilute and refresh the corrupted water, and precipitate noxious effluvia. We are informed by the same author that the inhabitants of Breda, during the season of bilious fevers, secure themselves from the noxious exhalations of a piece of marshy ground in its vicinity, by overflowing it with water.*

It is stated by Purchas, that 500 persons less died of the plague the day after the Nile overflowed the ground which had emitted the putrid exhalations that produced it, than had died the day before.

The manner in which the inundation of marshy grounds prevents the extrication of noxious exhalations, is not so much by the exclusion of air, for water is always saturated with atmospheric air, by which fishes are enabled to live in this element, as by keeping the temperature of the surface below the degree necessary for the speedy decomposition. As the particles of water heated by the sun's rays are specifically lighter than those beneath, it, of course, is physically impossible that they should descend, so as to impart their warmth to the subjacent stratum, as long as they retain this disproportionate superiority of temperature; so that when the water is deep the bottom must always remain unaffected by the heat of summer, and will consequently remain cool while the surface is warm, and in this way decomposition is prevented from taking place in the subjacent mass of vegetable and animal matter. Where, however, a thin sheet of water only is spread over the surface of the soil, the whole body of the fluid becomes heated by the sun, and decom-

* Diseases of the Army.

position takes place with as great and even greater facility than in those places where no stagnation of the water occurs. Water, however, is not so easily heated by the sun as the earth, and for two very sufficient reasons; 1st, the reflection of the sun's rays from the surface, by which they are prevented, in a great measure, from penetrating this fluid: 2d, the evaporation which takes place from the surface of the water, cooling the subjacent portion. The refrigerating power of evaporation will be explained under the head of *Prevention.*

Offensive exhalations, from whatever source, are probably analogous in their chemical and morbific properties to marsh miasmata, and are calculated by their offensive odour to inform us of their deleterious quality. There is probably no situation of the like dimensions so likely to generate fevers of a typhoid character as a ship, owing to the following causes: 1st, a vessel always contains a greater or less quantity of bilge water, which soon becomes putrid, as well from its own nature as from the mixture of various substances in the hold, and consequently emits unwholesome vapours: 2d, the close and confined construction of a vessel, and its many crannies and corners excluding a free circulation of air, and favouring the accumulation of filth: 3d, the crowded state of a vessel, and the little attention paid by sailors to personal cleanliness: 4th, the frequent want of fresh and wholesome provision: 5th, the qualities of the cargo, which frequently become offensive, and generate disease. "There was no sickness," says Dr. Blane, in the Ville de Paris, when in possession of the enemy, and the sickness which prevailed after her being captured seemed to proceed from what may be called simple putrefaction.—There was an instance of the same kind in one of our ships of the line, in which a bad fever broke out in the month of July, which seemed to be owing to the foul air of the neglected hold, for there was a putrid stench proceeding from the pumps, which penetrated the whole ship."* From the degree of putrefaction which often takes place in the hold of a vessel, we need not be surprised that fever of a malignant character, and even the yellow fever itself, should sometimes be generated on ship-board. It is still fresh in the recollection of many, how great a mortality occurred on board the Macedonian frigate, after a cruise of two months among the West India islands, in the summer of 1822. She arrived in Hampton Roads about the 5th of August, having lost 77

* Blane on the Diseases of Seamen, p 136.

of her crew, officers and sailors, with upwards of 50 sick on board at the time of her arrival. Such also was the fate which befell the crews of the frigate General Greene, commanded by Capt. Perry, the elder, which returned home in the year 1798 from the West India station; and the bomb ketch Etna from a similar cruise in 1807.

The yellow or bilious fever was generated on board the British ship Hibbert in 1804, on her passage from Portsmouth to New York, in consequence of her extremely foul and filthy condition.* Several of her people had died on her passage to New-York, whence she sailed without cleansing for Honduras, "as foul," says the editor of the Medical Repository, "as Styx or Cocytus." This vessel had been employed as a transport for soldiers from Portsmouth to Halifax, thence to Nassau in the Bahamas, and thence home to Portsmouth. There was so much offensive filth in this ship, that a physician, who went on board, declared he could with difficulty refrain from vomiting, on account of the filth of the great cabin. The disease was not communicated out of the vessel. The sickness and mortality on board this vessel, caused considerable alarm at Honduras; but as the disease was not communicated, all apprehensions subsided.—The inhabitants of Honduras, who extol the salubrity of their own settlement, according to the rules of contagionists, with much plausibility, traced the fever which prevailed on board the Hibbert, to New-York, the place from which she last sailed. Thus overlooking the efficient causes which were obvious and cognizable to the senses, and entirely exonerating the filthy condition of the vessel, in their zeal to trace the contagion to a foreign port.

Baron Laray, speaking of the diseases of Egypt, says, "The south winds are loaded with the putrid effluvia of animal and vegetable substances, evolved by the heat from the lakes that are formed by the subsidence of the Nile, or in the countries that are affected by the inundation; hence the principal causes of pestilential diseases. After the inundation of 1801, the plague made the greatest ravages among the inhabitants of Cairo and Upper Egypt. At this season, also in 1800, the yellow fever prevailed, and attacked our wounded, particularly at the siege of Cairo, while the plague scarcely appeared. I am led to believe that the atmosphere of Egypt, at this season of 1800, was analogous to that of St. Domingo."† The sickly season, which the Baron calls the

* Med. Repos. Vol. VIII. p. 71.

† Laray's Memoirs on the Campaigns of the French Army in Egypt.

fourth, begins about the first of March, and generally continues till the end of May.

Doctor Alibert's fourteenth proposition on *malignant intermittents*, is, that "all matters susceptible of decomposition more or less rapid, communicate a deleterious quality to stagnant waters, and render them capable of producing malignant intermittents."

It should be understood that what are called marsh miasmata, are not the result of pure and unmixed vegetable decomposition. According to the account of Lancissi, Charles Leigh, aided by a microscope, submitted the water of marshes to a very strict examination, and found it to be filled with a mixture of leaves, herbs, flowers, roots, seeds, &c. The myriads of wild bees, (says Dr. Mitchell,*) locusts, ants, cockroaches, sand flies, musquetoes, which travellers have noticed, and hundreds of other insect species, of which they know neither history nor name, must by their annual deaths, make an incalculable mass of animal putrefaction. The frogs, nutes, lizards, alligators, and other amphibious creatures, which yearly expire, add greatly to the heap. The different venomous kinds of animals, inhabitants of the water and mud, contribute mightily to the sum; and to all this must be added the vast amount of fishes, which die natural deaths, and are left to perish or rot upon the shore.

In the fever of Walcheren, which committed such ravages among the British troops, the causes are ascribed by Dr. Davis,† to the low and damp situation of Walcheren; the offensive stench which proceeded from the half smothered flames on entering the town; from the inundation laying half Walcheren under water, and which was even widely spread through the British lines, and lastly from many of the French being buried in heaps, for the purpose of concealment, and at the same time with a very superficial covering of sand. The disease prevailed with particular malignancy in the months of August and September, under the forms of quotidian, tertian, quartan, and remitting type, but more especially the double tertian, becoming more malignant by continuance, and degenerating into the continued and typhus character.

Hungary abounds with rivers, which, by often overflowing, leave that low flat country overspread with lakes and

* Tracts on Septon. p. 21.

† Scientific and Popular View of the Fever of Walcheren, Introduction, p. 11–12.

ponds of stagnating water, and with large, unwholesome, and putrefying marshes. The heat of the sun in summer, is more intense in Hungary (according to Kramer) than in any other part of Europe; and in proportion to the heat, the more pestiferous are the marshy exhalations. From what Kramer and others have advanced concerning the poisonous constitution of the air of Hungary, we may account for the vast and almost uniform fatality of the various and other pestilential diseases to which that country is unhappily subject.* In Temeschwar, the capital, a healthy person is scarcely to be seen. Baron Born, when here, fancied himself in the realms of death, inhabited by carcasses in fine tombs, instead of men; and at a dinner, to which he was invited, all the guests had a fit of the fever, some shivering, and others gnashing their teeth.†

In further illustration of this subject, I will here subjoin some useful observations by Dr. Colden, extracted from his work on the yellow fever of New-York in 1741 and 1742, from the first volume of the American Medical and Philosophical Register.

Dr. Rosinus Lentilius, the duke of Wirtemburgh's chief physician, observes, that there having been formerly a large swamp in the neighborhood of Stutgard, the capital of the country, that city was yearly subject to malignant fevers; but that upon the swamp being drained and converted into meadow ground, the city afterwards became healthy. In 1608, the river Morano having by a flood overflowed its banks, filled the adjacent lower part of the city of Rome with stagnating waters, which remaining there, corrupted, and sent forth stinking vapors, whereby the adjoining houses were infected, and became unpeopled by the death and flight of the inhabitants. Pope Clement VIII. ordered large drains to be cut, by which that part of the town was kept dry, and it continued afterwards always as healthy as the other parts of the city.

In 1695, that part of the city of Rome called the Leonine, became noxious and offensive to the inhabitants of that quarter, who were seized with epidemical fevers: as were likewise those of the adjoining parts to the northward of it; whilst those immediately to the southward, and the more distant quarters, remained healthy: these diseases were found to be owing to the neglect of scouring the ditch of the castle into which that quarter of the town was drained:

* Lind on the Diseases of Seamen, p. 57.
* See Edinb. Encyclop. Art. *Hungary.*

by cleaning out the ditch and opening the drains, that part of the town recovered its usual healthiness. The same author likewise takes notice that the owners of a particular part of the city where there were ruins of some old large buildings, having dug deep into them for materials for building, and suffering the water to stagnate in the pits, it began to stink, and the inhabitants of the neighborhood were seized with malignant fevers, which continued till these pits were filled up, after which the disease entirely ceased. The Tiber having overflowed its banks the 23d of September, Lancisi, chief physician to the reigning Pope, Clement XI, signified to the Pope the danger that the health of the inhabitants would be in from the stagnating waters, if they were not removed before the approach of summer. He set forth that the turbid water being carried into the lower parts of the town, filled the cellars of the houses and the wells, the waters of which chiefly served the common people for drink: that these waters, as they are strained off the earth, leave behind them all the filth with which they were impregnated from the dead bodies of insects, the carcasses of dead beasts, &c.; that this slime during winter remains fixed, and emits no vapors, but after the summer heat begins, it ferments and sends forth noxious vapors, exceedingly prejudicial to all the vital parts of the human body, and productive of fevers of the worst sort. He adds, that noxious vapors are not only thus produced at Rome, but in every other warm climate, except where they have frequent gusts of northerly winds during the summer, which dissipate vapors, that otherwise would remain in the circumambient air where they are generated. He puts the Pope in mind, that not long before a great destruction had happened among the inhabitants by camp or pestilential fevers, and that by the neglect of the governors of the city on an occasion like this. The prudent Pope, pursuant to his physician's advice, issued an edict for draining the waters, and clearing the city from all the slime and filth, and for keeping it clean and dry for the future; and care being taken to have this edict effectually put in execution, the city had remained to the time Lancisi wrote his book, the space of fifteen years, entirely free from all fevers of that kind. Pesaro is situated at the mouth of a river, near the Adriatic sea, in a plain, near great quantities of marshy and oozy grounds, and was famous in ancient times for the unhealthiness of the place. It continued so for many years, so that scarcely any of the inhabitants ever reached fifty years of age, until it had the good fortune to fall under the government of a wise prince, who,

in order to relieve the inhabitants from the mischievous effects of the situation of this place, opened the channel of the river, cut its course more direct, made large canals for draining off the water of the low places; and where they could not be drained, filled them up. This was done in the years 1515, 1517, and 1518; and from that time the city became healthy, populous and opulent; until the citizens, forgetting from what cause they enjoyed such blessings, suffered the channel of the river to fill up, and neglected the drains: this occasioned, in the years 1708 and 1709, grievous malignant fevers. An engineer was sent, by Lancissi's advice, to Pisaro, to contrive proper methods for draining the country, which being effected, the city was restored to its former state of health. Other instances of a similar nature are mentioned by the same author. The Roman historians observe, that as often as the drains of the city were neglected and stopped, so that the water and filth stagnated, the city became unhealthy, and the inhabitants were wasted by malignant and pestilential fevers. When this happened, the Romans spared no cost to cleanse and keep the city clean. C. Aquilius writes, that the common sewers being stopped by neglect, the Censors bestowed a thousand talents in opening and cleansing them. And it was the business of the Ædiles and Curators to superintend and enforce the necessary work. The effect of this care is manifest, when so great a city, crowded with such vast numbers of people, during all the time of its grandeur, remained exceedingly healthy, though, by the nature of the soil, it was most likely to be otherwise. But after all these works for keeping the city clean were destroyed by the incursions of the Goths and Vandals, Rome became exceedingly unhealthy.* And Pope Innocent III. writes in the 12th and 13th centuries, that few in Rome reached 40 years of age, and scarcely any 60. From 1705, malignant pestilential fevers became yearly epidemical in Urbevetano, a town formerly very healthy; this, Lancissi said, was occasioned by the inhabitants digging many pits in their low lands near the town, for rotting flax and hemp, at the same time neglecting these drains, and suffering their streets to become offensive to the smell by the filth that remained upon them. By Lancissi's advice, the Pope ordered these pits near the town to be filled up, and others made

* Romana vorax hominum domat ardua colla virorum;
Roma ferax febrium necis est uberima frugum;
Romanae febres stabili sunt jure fideles,
Quem semul invadunt, vix a vivente recedunt.

DAMIANI.

at a greater distance from the town. That the drains, cisterns, and cellars of the town, and the pits for rotting the flax and the hemp, should be yearly cleaned in the months of January and February, that the slaughter-houses should be removed out of the city, and set in such places where the filth exhaled, might be constantly washed away by every rain. These orders being effectually put in execution, the fevers did not return the following summer; and the town remained free from them to the time that Lancissi wrote in 1716. The citizens wrote an inscription on one of their gates, in commemoration of their deliverance from these pestilential fevers, and of the means by which it was procured. On the 1st of May, 1707, the hilly grounds to the southward of the town of Bagnarea, after continued great rains, began to fall into the river which was near that town, in such a manner that whole vineyards were moved from their places, and some houses entirely, without falling: in one of them a woman was delivered of a child, while the house was on its march. The channel of the river was choked and filled up. Numerous cracks, gaps and holes, were left in many parts of the ground, in which the waters stagnated and became extremely offensive to the smell. In the summer heats, the color of the inhabitants became of a dead swarthy yellow, and grievous pestilential fevers seized them. These were confined to the southern and lower parts of the town, while the other parts which stood high and at a distance from the stagnating waters, out of reach of the vapor which arose from thence, remained healthy, as usual. The channel of the river, by order of the magistrates, being cleared, drains made for carrying off the water, the places where it stagnated cleared, and the cavities, which could not be drained filled up, the inhabitants were the next summer freed from them till the time that Lancissi wrote, and he doubts not that they will continue so as long as they shall continue to keep the town and adjacent parts clean and free from stagnating water. In the public thanksgiving, ordered for this deliverance, the bishop declared the obligations they were under to Lancissi, by whose advice they had been delivered from such pernicious diseases. Lancissi was so much confirmed by long experience, that these kinds of fevers are occasioned by stagnating waters, that whenever he heard of such fevers breaking out in any place, he did not hesitate to affirm that they were occasioned by filthy offensive water, or slime stagnating in those places, and frequently before the inhabitants themselves had taken notice of the cause. This his conjecture was always confirmed upon a

proper inquiry. Ramazzini likewise observes, that in 1690, the inhabitants of the low moist parts of Modena were seized with epidemical fevers, while those of the high part of the city remained perfectly healthy. "I remember," says Dr. Colden, "that several years since when I was at Bristol, in Pennsylvania, opposite to Burlington, which is situated to the northward of a large piece of swampy ground, they told me that they had been, from the first settling of Bristol, subject to intermitting fevers of a malignant kind, and, indeed, the aspect of the inhabitants showed the ill effects of the air which they breathed. They assured me, at the same time, that not above two or three children, born in that village, since its first settling, had attained the age of maturity; but since that time, these swamps having been drained, and converted into profitable meadow grounds, I am informed that Bristol is in a great measure freed from those annual epidemical fevers. A fresh water pond and meadow of stagnating water, not a mile to the northward of the city of New York, has been lately drained for the benefit of the soil, without any thought of any advantage to the health of the neighboring inhabitants, though its effects in that respect are very manifest. Every summer the inhabitants of the houses on the north side of it, before it was drained, were subject to malignant intermittents, and several, in the few houses there, yearly died. Since the draining of that place, these houses are become as healthy as any in the neighborhood. Caspar Cantarini, in his account of the republic of Venice, mentions a new college, or council of magistrates, appointed not long before his time, to take care of the health of that city, and whose business, among other things, was to cause all filth and other nuisance to be removed, and the city kept clean. He observes, that before this institution, Venice had been frequently subject to pestilential distempers, insomuch, that many of the inhabitants for that reason had deserted their houses, and removed their families to the continent; but, that after these magistrates were appointed, who continued vigilant in their duty, the city had always remained free from any malignant pestilential distempers."

Antoninus Galatheus attributes the unhealthiness of the once famous Brundusium, to the neglect and carelessness of its inhabitants. "Moreover," says he, "cities situated in a healthy climate have been destroyed. Cities, indeed, like men, have their vicissitudes, but the neglect of its inhabitants has been the ruin of Brundusium; for had outlets

been made for its waters, it would never have acquired such an unhealthy distinction."

Dr. Robert Hamilton ascribes the fever which prevailed at Lynn in 1779, and the five following years, to an inundation from the sea, leaving on its recess a mass of animal and vegetable matter to putrify upon the shore.—This fever he considers to be of the same nature as the yellow fever of the West Indies, as described by Dr. Hillary; the tertian of Minorca, by Cleghorn; and the remitting fever of Bengal, by Clark. He observes, that many convalescents from this disease became scorbutic and dropsical.*

It is remarked by the celebrated Zimmerman, that exhalations from marshes do not seem to be so noxious in cold as in hot countries, yet malignant fevers occur, as in Zealand. In Germany, these exhalations produce tertians; in Hungary, petechial fevers; in Italy, the hemitritaæ;† and in Egypt and Ethiopia, pestilential fevers.‡

It would be a curious and interesting subject of investigation, to trace the gradually increasing malignity of endemic fever from the northern boundary of the temperate to the torrid zone. We should find, that, other circumstances being alike, there would be a progressive increase in the severity of the symptoms as we approximate towards the sultry climate of the equatorial latitudes; and that local causes, which, as far north as New-York, would merely give rise to regular tertians, in Georgia and Alabama would produce the yellow fever, or the malignant bilious remittent. This influence of change of climate in mitigating or aggravating the character of endemic fever, corresponds with the progress of the season in changing the type of local epidemics.

In Zarbat, in Scotland, a putrid fever sometimes occurs, and after death the body turns yellow: this may be ascribed to certain natural locks or ponds which sometimes dry up in the summer.§

One of the most remarkable diseases incidental to an army, recorded by Diodorus the historian, broke out among the Carthagenians at the siege of Syracuse, about 410 years

* Observations on the Marsh Remit. Fever, p. 87.

† "The febris hemitritea, or semi-tertian fever," says Senac, "we may consider as a continued double tertian. Such, however, is the peculiarity of its type, that one of its paroxysms is ushered in by a cold fit, whilst the next is not, and so on, alternately. *Senac on Intermitting and Remitting Fevers*, p. 105.

‡ Zimmerman on Experience in Physic, p. 131.

§ Sinclair's Scotland.

before the Christian era. This was at the time of the famous expedition of the Athenian generals, Eurimedon and Demosthenes. The disease originated from an offensive marsh in the vicinity of the city, and increased to such a degree of malignancy as to destroy nearly the whole army.* In the 14th book, chapter 7th, the same author gives a detailed account of a fatal disease which invaded the Carthagenians the year before Christ 394, when encamped upon the same ground that had been formerly occupied by the Athenians. He calls it a plague; and tells us it was first ascribed to the vengeance of the gods, for the rifling and plundering the temples of Ceres and Proserpine. Physical causes, however, of a local nature, were considered by him as the principal occasion of the disease. The ground was wet and marshy; great multitudes were confined within a narrow compass, exposed to the scorching heat of the sun by day, and by night to the cold damp air, and noxious steams and exhalations, arising from the marshes and from the bodies of those who lay unburied. The symptoms were catarrhs and swellings of the throat, which were caused by the stench of the dead bodies, and the miasms from the swamps and low grounds. These symptoms were followed by fevers, pains in the back, heaviness of the loins, dysenteries, blotches and boils over the whole body. Some, in a state of raging madness, ran about the camp and beat all that came in their way.

It is said of Syracuse, that "the least stagnant water is sufficient, in the heat of summer, to poison the atmosphere: its effects on the countenances of the poor people who live in its vicinity, are very evident; and a stranger who travels through the island in this season, ought to avoid ever passing a night near them." (Ec nige Berichten, &c.) "As soon as the sun enters the lion, this country becomes the house of death: fevers of the most malignant kind, seize upon the imprudent or unfortunate wretch that spends a night near them, (*ponds and marshes;*) and few escape with life when attacked by so violent a disorder."†

Fracastorius attributes the pestilential fever attended with petechiæ, which appeared in Italy about the year 1530, to an extraordinary inundation of the Po, which upon receding left the marshes to corrupt and infect the air through the summer.

* Diodorus, lib. xiv. cap. 2.
† Swenburn's Travels, Vol. II, § 49, Dublin edit.

It is recorded by Forestus, that from the putrefaction of the water, the city of Delft, in which he practised, was scarcely, two years together, free from the plague or some pestilential distemper.

In the year 1694, a fever broke out at Rochfort, in France, which, on account of the uncommon symptoms and great mortality, was at first believed to be the plague. But M. Chirac, who was sent by the court to inquire into its nature, found the cause to arise from some marshes that had been made by an inundation of the sea. He observed, that the offensive effluvia, which smelt like gun-powder, were carried to the town by the wind, that had long blown from the quarter where these marshes were situated. Such was its mortality, that two thirds of those who were seized, fell victims to the disorder.*

It is remarked by Assalini, in his account of the diseases of Egypt, that the heavy rains which fall during the winter at Damietta, Rosetta, and Alexandria, contribute greatly to produce disease, which the south winds, the fogs, and the exhalations of the marshes, render more dangerous; and that the diseases are most frequent when the inundations of the Nile are high and of long duration." "At this day," says he, "the lakes, the marshes, and the filthiness which one finds in the cities of Lower Egypt, are the principal causes of the frequent diseases to which they are subject, and which can never be eradicated until we have found means to purify the atmosphere of their environs. This important advantage may be obtained by draining off the waters of the lakes, and filling them up; by keeping the cities clean, and giving a free exit to the rain water, which stagnating in different parts of the cities becomes corrupted, and conjoined with filth, infects the atmosphere."

Baron Laray informs us, that from the 21st of August till the autumnal equinox, the inundation of the Nile increases, and all Egypt is like a sea, in which the towns and villages appear like so many islands, and the inhabitants communicate with each other by means of boats. Towards the end of September, the waters retire, when they cultivate the earth. The sickly season begins about the first of March, and generally continues to the end of May.†

* This statement is quoted by Sir John Pringle, from *Traits du Fievres Maligns. Oeuvres Posthum. de M Chirac, Eleg. de M. Chirac, par M. de Fontville* In those who were opened, says Sir John Pringle, the brain was found either inflamed or loaded with blood, the fibres of the body were uncommonly tender, and the bowels were either mortified or in a state of suppuration.

† Laray's Memoirs, Amer. Edit. Vol. I.

We are informed by Dr. Lind,* that in the month of August, when the thermometer often rose to 82° in the middle of the day, the marines, who were exercised three times a week, early in the morning on the South Sea beach, suffered much from the effects of an adjoining morass. Half a dozen of them at a time, were frequently taken ill in their ranks, while under arms; some were seized with such a giddiness in the head, that they could scarcely stand; others fell down speechless, and upon recovering their senses complained of a violent head ache. When such patients were received into the hospital, some few had a regular ague, but far the greater number labored under a remitting fever, in which, indeed, there was no perceptible remission for some days. A constant pain and giddiness in the head were the most distressing and inseparable symptoms of the disease. Some were delirious, and a few vomited a quantity of bile; in all, the countenance was yellow.

It is related by Lancissi, that thirteen gentlemen and ladies of the first rank in Rome, having made an excursion upon a party of pleasure, towards the mouth of the Tyber, the wind suddenly shifted, and blew from the south over the putrid marshes, where the whole party, with the exception of a single individual, were immediately seized with a tertian fever.

Cabbages, as abounding with azote, approach in their chemical properties to the nature of animal matter, and in undergoing decomposition, become extremely offensive and unwholesome. Instances of fever originating from this source, have frequently occurred. One is related by Dr. Rogers,† and another, much to the point, is given by Dr. Bailey, in his Treatise on the Epidemics of New-York in 1795, page 84, *et seq.* "Some time since," says the Doctor, "I was called to visit a young man about eighteen years old, in a family in the skirts of the town. (Hartford.) He was violently attacked with most of the characteristic symptoms of yellow fever. The next day, a second was taken in the same manner; and on the morning of the third, three more were taken sick. This led me to suspect some particular cause. I searched for it in vain that time. The next morning, in passing through the kitchen, I smelt something that was very offensive, which none of the family had noticed. On opening the cellar door, I found that it proceeded from the cellar. Two persons went down to exam-

* Essay on the Diseases incidental to Europeans in Hot Climates, p. 23.
† Essay on the Epidemic Diseases of Cork.

ine, and found in one corner of a small tight room, a quantity of June cabbages, on which the sun had shone about three hours in the day. They had rotted, and sunk down in a heap of putrefaction. They run a stick under them and lifted them up, and there immediately issued such an intolerable stench, as obliged them instantly to leave the cellar. A vomiting was brought on, which lasted more than an hour. Notwithstanding that the doors and windows of the cellar were thrown open, it was two days before they could clean it out. No other person in the family was taken afterwards, and those who were already seized soon recovered."

A heap of cabbages, in a state of putrefaction, gave rise to a malignant fever at Oxford several years ago, which proved fatal to several students of that university, and to many of the inhabitants of the place.

Dr. Rogers, in his account of epidemic diseases, ascribes the unhealthiness of the city of Cork in his time, to the following circumstances. The city of Cork is built on islands, surrounded by branches of the river Lea, in their own nature marshy, and which were subject to the overflow of the spring tides, till the ground was raised by art: it is situated in a deep valley, where the rest of the marshes, both of the east and of the west, are constantly covered by the overflowing of the spring tides; and in the interim, putrid vapors are exhaled from them; continued ridges of hills bound this vale on the north and south, on which the suburbs are built. Besides this situation of the town itself, he mentions four other concurring causes. *First*, the great quantities of filth, ordure, and animal offals in the streets, and particularly the close, confined alleys and lanes. *Secondly*, the great number of slaughter-houses, both in the north and south suburbs, especially on the north ridge of hills, where are vast pits for containing the putrefying blood and ordure, the steam and vapors of which taint and corrupt the wholesome breezes. *Thirdly*, the unwholesome and foul waters, that great numbers of the inhabitants are necessitated to make use of during the dry months of summer. *Fourthly*, the vast quantity of animal offals used by the meaner sort, during the slaughtering seasons; which, according to our author, occasions still more mischief, by the quick and sudden transition from a diet of another kind and different nature.*

Pulo Bay, in the East Indies, is remarkable for the pestiferous quality of the air, occasioned by the lowness and swampiness of the soil, full of ponds of stagnating water,

* Rogers on Epidemics, p. 36-7.

which exhale an offensive effluvium. Capt. Delano says, that he lost there twenty men of his crew, in half the number of days.*

The indigenous fevers of Batavia, Calcutta, Gorce and Surrinam, are universally acknowledged to originate from the exhalations of putrefying animal and vegetable matter. In all spots of the East Indies situated near large swamps,† on the muddy banks of rivers, or the foul shores of the sea, the vapors exhaling from the putrid stagnating water, either fresh or salt, from corrupted vegetables and other impurities, produce mortal diseases, especially during the rainy season. There is a place near Indrapour, in Sumatra, where no European can venture to remain, or sleep one night on shore during the rainy season, without running the hazard of his life, or at least a dangerous fit of sickness. And at Padang, a Dutch settlement at Sumatra, such is the pestilential quality of the air, that it is commonly called the plague coast. There a thick pestilential vapor or fog arises after the rains, from the marshes, which destroys all white inhabitants.

I shall here add a few remarks on the climate of Batavia, as illustrative of the subject on which we are treating, and serving to show the powerful influence of heat, moisture and putrefaction, in the production of diseases. The following paragraph is extracted from the Edinburgh Encyclopedia.

After describing the abundance of its productions, and the beauty of the country, the author draws the following melancholy contrast. "In the midst of plenty, beauty and gaiety, every countenance indicates debility and languor. There is pestilence in the air, and poison in the water. The atmosphere is constantly infected with deleterious vapors, which rise from the surrounding swamps and morasses; *and the trees with which the quays and streets are crowded, impede the free circulation of the air, which otherwise would, in some degree, be dissipated.* (qr. *renovated.*)‡ Fevers, which are here the general denomination for all kinds of illness, are continually raging in the colony. Of strangers, who came to settle at Batavia, three out of five are reckoned to die the

* Delano's Voyages, p. 153.

† Lind on the Diseases of Hot Climates, p. 85.

‡ These lines marked in italics are exceptionable, since, as has already been shown, the growth of trees and plants is one of the greatest natural preservatives of health; and so far from causing an obstruction to the wind, when planted in straight lines parallel with the streets, as they should be, they aid its circulation, by producing a greater degree of coolness in their vicinity and shade.

first year; and it appears from calculation, that the company lose annually one fifth of their servants. Such is the general apprehension of the unhealthiness of this colony, that even the temptation of quickly amassing a splendid fortune is insufficient to induce those who can reside at home with any comfort, to seek a settlement in Batavia. Many offices and professions are thus necessarily entrusted to persons little qualified for fulfilling their duties; and it is worthy of remark, that one of the clergymen, and the principal physician, had originally been barbers."

Dr. Ffirth, in his account of Batavia, has, likewise, some interesting observations.* He represents the exhalations arising from the mud and stagnating water as extremely disagreeable, and of such pungency and strength as to occasion opthalmia, vertigo, nausea and vomiting, upon exposure to them. "In going up the canal," says the Doctor, "from a ship lying in the harbor, you are certain to meet large quantities of putrid animal matters floating down. What with the sight of dead Malays, in every stage of putrefaction, and torn in pieces by the alligators, dead horses, cows, &c. producing an intolerable stench, and the inundations from the banks of the canal, and the meadows already mentioned, combined with the intense heat of the sun, and its reflection from the water, you are certain to have a considerable degree of nausea, with head-ache and great languor produced. Strangers, on the slightest irregularities, are sure to suffer, as it only requires an exciting cause to produce the disease at any time."

Dr. Ramsay, in a letter to Dr. Mitchill, enumerates the following as the causes of the pestilential sickness in Norfolk, Virginia, in 1795.† The warmth of the season; the low situation of the town; accumulation of animal and vegetable matter in the gutters, which being obstructed formed a mass of corruption; a part of the town being constructed of wooden houses, built upon large log frames, filled in with small wood, and many of them not filled in at all, but serving as receptacles to all manner of filth of the poor who lived in them, and who, being mostly foreigners, used large quantities of beef and fish.

The noxious influence of the marsh miasmata from the borders of Onondaga lake, (N. Y.) are related by Dr. Vandervoort, in his essay on the analysis of the Ballston mineral

* See Dr. Ffirth's Account of his Voyage to Batavia, in Dr. Cox's Philadelphia Med. Museum, Vol. I. p. 48, et seq.

† Webster's Collection of Papers on Bilious Fever, p. 156.

waters. "The marsh effluvia," he observes, "in this western territory, in many places, and particularly in this place, operate so powerfully on the human body, as to induce a paroxysm of an intermittent in the course of four or five hours, and frequently death the seventh day. From ocular observation in these marshes, it appears that the poisonous effluvia are generated from the putrefaction of vegetable matter, which, in its resolution, undergoes certain changes, which produce this noxious air. It is also evident that this does not operate where the marshes are inundated."

In the account of Mr. Andrew Ellicott's voyage down the Ohio river, in the month of November, 1796, the following facts are related. "Many of the inhabitants (of Gallipolis) this season fell victims to the yellow fever. The mortal cases were generally attended with black vomiting. This disorder certainly originated in the town, and, in all probability, from the filthiness of the inhabitants, added to an unusual quantity of animal and vegetable putrefaction, in a number of small ponds and marshes within the village. The fever could not have been taken there from the Atlantic states, as my boat was the first that descended the river after the fall of the waters in the spring; neither could it have been taken from New-Orleans, as there is no communication at that season of the year up the river: from the latter to the former of those places, moreover, the distance is so great that a boat could not have time to ascend the river after the disease appeared that year in New-Orleans, before the winter would set in."*

It appears from the account given by the Rev. Azel Backus, in a letter to Dr. E. H. Smith, of New-York, that the epidemic which occurred in the town of Bethlehem, Connecticut, in the year 1750, and which the neighboring physicians called the plague, from the severity and mortality which marked its progress, was occasioned by the letting out of the stagnant water of a pond, that had been made to accumulate in the valley, for the purpose of destroying a growth of small vegetables. "With its stream," he observes, "the pestilence issued, which carried off between thirty and forty of the most hale and robust inhabitants."†

Facts relative to the Black Vomit, Dysentery, &c. as they occurred in Mifflin County, Pennsylvania, during the hot weather of 1797 '98 *and* '99. *By Dr. William Harris.*‡ "It is now twenty-five years," says the above mentioned au-

* Steam-boats were not then in use.

† Med. Repos. Vol. IV. p. 74.

‡ Med. Repos. Vol IV. p. 105-6.

thor, "since the first settlement of the country, notwithstanding the ponds of water, which during the whole summer have been kept full, the inhabitants have enjoyed good health till within these three years. The water is now exposed to the rays of the sun, and becomes nearly dried up towards the latter end of summer. It is in many places covered with a greenish scum, from whence arises a very unpleasant smell. The consequence is dysentery, intermittents, and highly malignant febrile complaints, which in some instances prove mortal in forty-eight hours, and three days, having every symptom as described by medical authors, of the pestilential disease, or *yellow fever*, of New-York and Philadelphia. In the year 1797, it was as fatal in Milesborough, which lies upon the Bald Eagle Creek, according to the number of inhabitants, as it was in Philadelphia in 1793. A large pond of water stood within the neighborhood of the town. The season being very dry and warm, the water, which before was shaded by trees, was now exposed to the sun, and was, in a great measure, dried up. The pond abounded with putrefying vegetables, the stench of which proved very disagreeable. Few in the town escaped sickness of the most malignant kind, which continued through the months of August and September. The pond has since been drained off, and the inhabitants are as healthy as usual." The same author remarks, page 106 of the work above referred to, that many vomited a dark, filthy, brown substance, and sometimes nearly as dark as ink, which was so offensive as to cause nausea, and even vomiting, in the attendants.

We are informed by Dr. John Scott,* that between the years 1792 and 1796, a gentleman, a few miles above Haverstraw, New-York, began to erect a furnace and forge in the mountains, for which purpose he built a dam across a large stream of water, and overflowed an extensive tract of land; small houses were erected for his laborers, who carried on the work with vigor until autumn, when the pond, from the heat of weather, became dry, and his laborers were soon after attacked with a malignant fever, which proved fatal to most of them; the few survivors fled, and the work remains abandoned.

A malignant fever originated in the town of Greenfield, Saratoga county, (N. Y.) in the year 1797, in consequence of the erection of several mills in the town, which caused much land to be overflowed. In the fall subsequent to this

* See Med. Repos. Vol. X. p. 240.

erection, the water became dried up, and whole families were seized and carried off with a malignant bilious fever. This fever was attended with the same symptoms that characterized the yellow fever of the same season in the city of New-York. The succeeding years, the new ponds were emptied every May, and not filled till fall, and their malignant fevers visited them no more.

The following fact is communicated by Dr. Watkins, from his personal knowledge.* There is a village called New Design, about fifteen miles from the Mississippi, and twenty from St. Louis, containing about forty houses, and two hundred souls. It is high ground, but surrounded by ponds. In 1797, the yellow fever carried off forty-seven of the inhabitants, or more than a fifth. No person had arrived at that village from any part of the country where this fever had prevailed, for more than twelve months preceding. Our informant resided in the village at the time; and having seen the disease in Philadelphia, he declares it to be the same that prevailed at New Design. He also mentions an Indian village depopulated by the same disease two or three years before.

Dr. Warren, in a letter to Dr. Eliphalet Pearson, describing the yellow fever of Boston, says,† "Having almost every fall, seen a considerable number of cases, very similar to the above, not excepting the black vomit, nor the yellow skin, together with other circumstances usually attendant on fevers of this denomination, I have been induced to believe, that the disorder in question was no other than what has, more or less, prevailed here every year, and is what is properly termed a *bilious remittent fever*. That it originated from noxious substances, exhaled into the atmosphere from putrefying animal and vegetable substances, or both, is extremely probable, from the places in which it was most prevalent."

Dr. Drisdale, in his account of the yellow fever of Baltimore in 1794, says, it was impossible to ascertain any means by which the yellow fever could have been imported; and reasonably imputes it to the existence of the black, putrid, and offensive water under the floors of those stores where the sick resided, and to putrid exhalations from the dock and from an extensive marsh when the north wind prevailed.‡

A fever of a malignant character, and such as Dr. Hamilton and Dr. Alibert have denominated the malignant inter-

* Med. Repos. Vol. X. p. 74.
† Ibid, Vol. I. p. 135.
‡ Cox's Philad. Med. Mus. Vol. I.

mittent, originated in the town of Sheffield, Massachusetts, on the Housatonic, in the years 1793, '94 and '95, from the putrefaction of the neighboring morasses.* The banks of the river were interspersed with coves and extensive marshes of stagnating water, in addition to which were two mill dams, which caused a considerable tract of country to be overflowed with water, and which drying up as the heat of summer increased, exposed a vast bed of offensive and putrefying animal and vegetable matters. The consequence was fever of a malignant aspect, in some cases attended with yellowness of the skin.

I have annually observed a number of cases resembling the fever above spoken of, less malignant than the bilious remittent, but much more so than the ordinary intermittents of temperate climates, and which, if neglected, soon assuming the character of the bilious remitting or yellow fever. A similar fever occurred in 1779, in Ontario county, (N. Y.) Its remedies were plentiful purging at the commencement with calomel and jalap, and the liberal use of the bark as soon as the remissions would admit of its exhibition.†

I am aware that it has been attempted to be shown by some physicians, and particularly by Dr. William Ferguson, that endemic and yellow fevers arise from something different from putrefactive exhalations, from the circumstance of their prevailing in certain dry seasons and situations, where no putrefactive sources apparently existed. In answer to this, I will subjoin the following observations of Dr. Rush. "Dr. Gordon informed me.‡ that five hundred persons died of the yellow fever in Berbice, (Surrinam,) between July, 1804, and May, 1805, during which time there fell not quite three inches of rain. The earth, in this case, was every where dry and parched. Bilious fevers, Sir John Pringle tells us, occur in a part of Holland in very dry seasons, but in these cases the earth cracks, and putrid exhalations escape from water which stagnates below its surface. The same cause which produced these fevers in Holland, probably induced the fever at Berbice, mentioned by Dr. Gordon, as also all such bilious fevers as appear under the same

* See Dr. Buel's Letter in Webster's Collection of Papers on Bilious Fevers, p. 53 & seq.

† The attention of physicians was first called to the consideration of this form and variety of fever from the accurate description of Morton; and more recently the inquiry has been industriously and ably conducted by Torti, Lautter, Werlhof, Senac and Cleghorn.

‡ Inq. and Obs. Vol. IV, p. 181.

circumstance of apparent absence of moisture and putrefaction." In further illustration of this fact, I would observe, that in the months of June and July, in 1823, during a hot and dry spell of weather, a high grade of bilious fever prevailed in various parts of the prairies in Alabama. The soil in those parts of the country where the fever made its appearance, was exceedingly rich, deep and black; but except in the hollows, the surface was dry, parched, and cracked open. Upon removing this crust, however, which did not exceed half an inch in thickness, the soil was perfectly moist beneath; and from the offensive smell which issued from it, and which was very perceptible after sunset, appeared to be in an active state of putrefaction.

It may be asked if the bilious, endemic or yellow fever, is produced by heat and putrefaction, why does it not occur every season in places which have once been visited by it? To this I would answer, that certain seasons and circumstances are more favorable than others to the decomposition of animal and vegetable matters, and to the developement of the semina of bilious fever. It is not contended that putrefaction, in every instance and situation where it may exist, will necessarily and inevitably give rise to bilious fever. But it is maintained, and without the fear of contradiction, that wherever this disease has prevailed in our country, there have existed in the vicinity of its prevalence the materials and requisites of putrefaction and decomposition in no inconsiderable degree.

It has been remarked by Lancissi and others, that the mixing of the salt water with the fresh along the sea coast, and places accessible to the tide, is peculiarly favorable to putrefaction, and the consequent production of disease.—The experiments of Sir John Pringle would seem to prove that a small proportion of salt promotes instead of retarding putrefaction. But as it respects the mixing of salt and fresh water in bays and barbors affected by the tide, the truth of the position, I believe, has not been proved by general experience, nor has it been found that putrefaction in such places is more rapid than in fresh water ponds and marshes. It is well known, however, that in all large sea-ports there is a very considerable accumulation of filth about the docks, occasioned by the wash of the cities, the lading and unlading of vessels, which corrupts and infects the air from its own intrinsic tendency to putrefaction, and not from any adventitious agency of salt water. It was well observed by Fortunatus Fidelis, that "some unknown mischief is engendered in places along the shores of harbors. For there many

vessels are moored, all their nastiness is accumulated, and the excrements of cities deposited. Wherefore, although the maratime aspect of the place promises something highly encouraging to health, yet it is all marred by this horrible mixture of things." The fact would seem to be, that the pure muriate of soda possesses, in any quantity, an antiseptic property. Liverpool salt, however, prepared as it is by artificial evaporation, possesses many impurities foreign to the preserving virtues of the pure muriate of soda. And we are informed by Dr. Percival, that Sir John Pringle told him "he had long believed the septic quality of the sea salt, as employed in his experiments, was owing to some heterogeneous substance blended with the article, and not to any putrescent quality in the mere muriate of soda, or pure sea salt itself."

Some have pretended to deny the pernicious influence of effluvia arising from the putrefaction of animal matter; and it has been brought forward as an argument in favor of this opinion, that butchers, tanners, oil sellers, or dealers in oil, the manufacturers of ammonia, &c. remain healthy notwithstanding the offensive effluvia with which they are surrounded. Such instances of exemption, however, can furnish no conclusive argument that such occupations are in themselves peculiarly healthy, any more than the argument, that because an unusual quantity of spirits does not produce intoxication in an habitual dram drinker, it is therefore destitute of any inebriating quality whatever; for we know that long familiarity with, and exposure to, otherwise noxious agents, fortifies the body, by custom, against their pernicious influence. In this way are we enabled to account for the exemption of the butchers from the yellow fever which prevailed in Philadelphia in 1793. "It has been often remarked," says Van Swieten, "that workmen employed in tanneries, in the preparation of skins, intestines, animal gluten, &c. who continually breathe an air charged with putrid exhalations, enjoy good health, while strangers cannot, with impunity, approach the place where these fœtid substances are manufactured."*

One of the most conspicuous abettors of the opinion, that animal putrefaction is exempt from any injurious consequences in the production of disease, is Dr. Chisholm, an advocate, also, for the contagion and imported infection of the yellow fever. It appears that Dr. Hosack is likewise inclined to this opinion. Though it can hardly be suppo-

* Van Swieten. Comment. in Boerhaave. Alph.

sed that every animal whose carcass rots upon the surface of the earth, should occasion a pestilential atmosphere in its vicinity, yet instances upon a larger scale are too numerous to admit the conclusion, that the putrefaction of animal matter has no noxious or morbific tendency. This opinion of Dr. Chisholm and Dr. Hosack, is akin to that of Alexander Benedictus, whom Lancissi styles the *first patron of stinks, and adviser of their remedial operation.* "Some have entertained the notion," says Lancissi, "that the effluvia of corrupted substances had no manner of noxious operation, because they had read that these very agents were sometimes considered as remedies in some pestilential seasons. Thus Alexander Benedictus states, "that he had heard from a merchant of Candia, that all the dogs were killed during the prevalence of a violent plague, and by order of the physicians thrown about the streets. The air was soon filled with their corrupting exhalations, and their *remedial operation* immediately restored the place to health." Very near akin to this story," says our author, "is another related by George Pictorius, "who heard a man from Utopia affirm, that in an epidemic plague, nothing was more wholesome and excellent than three times a day to snuff up the fumes of a privy, or of a sheep-fold." So also Joseph Quercetanus adduces the case so familiar to the people of Paris, to wit, that of the nastiness of their streets being considered by many physicians as checking the putrefactive taint of their atmosphere. Nor are there wanting other authorities from very serious writers, collected by Gaspar a Rejes, by which it is shown that bad smells are sometimes valuable auxiliaries of nature. But we have nothing to apprehend in making a full reply to these observations. As to Alexander and Pictorius, the experiments were not made by themselves, but told on the credit of others. The former got his story from a Cretan merchant, and the latter from an Utopian traveller." In relation to this subject, Lancissi makes the following remark. "What satisfies us of the ease with which wise men commit blunders, when they start wrong, is this, that our opponents have mistaken the antidote for the poison, and the remedy for the matter of mischief."*

The noxious influence of animal putrefaction will be better illustrated by a few examples.

We are informed by Alexandrianus, Diodorus Siculus, and others, that plagues have arisen from the putrefaction

* Translation of Lancessi's Work by Dr. Mitchill, Med. Repos. Vol. XIII. p. 126.

of dead bodies after battles. In confirmation of this fact, we are referred by Diemerbroeck (*De Peste*) to Hieronimus, Augustinus, Sobalius, Wolfius, Angelus, Paræus, and Agricola. Diemerbroeck, speaking of his own experience, says that a very bad malignant fever was produced by the putrefying remains of 8000 Germans, together with horses which were left slain on the plain of Juliers, in the summer of 1642, and that a similar disorder immediately appeared after the severe engagements between the Austrians and Swedes, owing to the neglect of burying the dead.

Forestus relates that a dead whale cast upon the shores of Holland, occasioned an extensive pestilence in Egmont. The same author mentions a fever which originated in Venice, in his time, from the putrefaction of a quantity of small fishes, which abounded in that part of the Adriatic. And Paræus informs us that a severe plague which spread over the whole extent of Tuscany was produced by allowing a whale to putrefy, which had been thrown upon the shore.

The circumstance, that on other occasions dead bodies have putrified upon the ground without producing any pestilential disorder, will not invalidate the conclusion, that such effects have in other instances been occasioned by them; and in these exceptions, the want of exposure to the exhalations, and the season of the year, may have been the cause of their not proving equally injurious.

We are informed by Dr. Lind,* that at Bencoolen, the diseases that always raged violently during the month of October, are occasioned by dead fish and other animals left by the Ganges; and that the unhealthiness of Gambroon arises from vast quantities of little fishes left upon the shore, which soon become putrid, and contaminate the air.

It is related by historians, that in the year of Rome 628, and B. C. 126, a most destructive pestilence was occasioned in Africa by dead locusts: A strong east wind brought the swarms of these animals towards Numidia and Utica in such astonishing multitudes, that they devoured every leaf of vegetation, and even the bark of the trees. A south wind drove and precipitated them into the Mediterranean, and being washed on shore in the hot season, they putrefied and caused a most dreadful plague. We are told that 800,000 persons perished in Numidia, 200,000 on the sea-coast of Carthage, and 30,000 of the Roman troops.† It is said by

* Lind on the Diseases incidental to Europeans in Hot Climates.

† Livy Epit. 60 Orosius lib. v. p. Diac. August. Hist. 613. The reader of sacred writ will call to mind the Mosaic account of the plagues of locusts in

Orosius, that the effects of this pestilence were not confined solely to the human species; such was the corruption of the air, that a general mortality of birds, cattle and wild beasts, marked the progress of its destructive ravages, and served to increase the dreadful calamity and desolation.

Dr. Monro gives an account of a pestilential fever, or plague, which appeared among the soldiers encamped about Warburgh in 1760, occasioned by the putrefaction of an infinite number of dead horses and men, scarcely covered with earth.*

A barbarous stratagem is related by Mr. Gibbon, in his account of the Saracens, when they overran Africa: One fortified place was impregnable to their warlike machinery; and as they did not choose to starve it to compliance by a siege, they therefore gathered all the inhabitants of the country round about, and murdered them, and left the dead bodies round the walls; in consequence of which a violent fever, or plague, soon obliged the place to submit, after most of its defenders were dead, and the remainder debilitated by sickness and fatigue.

M. De Lassone gives an account of a malignant fever and dysentery, produced by the putrefaction of animals that had died of an epidemic disease in Paris and its environs. By being but slightly and imperfectly covered with earth, putrid effluvia were evolved, and produced disease among the neighboring inhabitants; which ceased, upon the dead bodies being effectually covered with lime and earth.†

It is reported by Lancissi, that near Rome is a place where the carcasses of horses and mules are carried to be skinned and cut into meat for feeding hounds and cats.—When this business is negligently performed, and the bowels and limbs thrown into the river lodge in the nooks and corners of the bank, the neighboring inhabitants immediately suffer from the corrupted condition of the air, and become afflicted with malignant and pestilential fevers.

Egypt, in the time of Pharaoh, B. C. 1491; which we are told was preceded by a strong east wind, which continued to blow for a day and a night, and in the morning brought the locusts in such myriads, that "before them there were no such locusts as they, neither after them shall be such. For they covered the face of the whole earth, (*Egypt,*) so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees which the hail had left; and there remained not any green thing in the trees, or in the herbs of the field, throughout all the land of Egypt."—Genesis, chap. 10.

* Monro on the Diseases of the Army, Vol. I. p. 226.

† Med. Comment. Vol. VIII. p. 53.

When the vapors of animal putrefaction are pent up and confined in a narrow space, they are thereby rendered more concentrated in their virulence and more fatal in their operation. In illustration of which, the following instances may be considered as striking and instructive.

We are informed by Mr. P. C. Varle, that in the summer of 1783, M. Faure, a merchant of Norbone, in Lower Languedoc, in France, bought a house which had been previously occupied as an anatomical hall; and, being desirous of having a cave dug in the cellar, employed three men to do it. In digging, they came to the wall of a necessary, which had been the common receptacle of the remains of human subjects, and which was covered, to prevent detection; and on extracting a few of the stones with their picks, an offensive putrid matter rushed through the aperture; and such was its virulence, that it produced instant suffocation. M. Faure, coming to see the workmen, descended but two or three steps before he fell senseless. The neighboring people, perceiving the putrid smell, went to the house; and of nine that entered to bring out the sufferers, six died. M. Faure was recovered from the first impression, but died four days afterwards; and the unfortunate laborers survived but a day or two.

In Pierre Cotte's Treatise on Meteorology, he gives the history of the case of a grave-digger in 1773, who by accidentally opening a coffin that had been buried a year before, was suddenly killed by the vapor that issued from it. He further adds, that in the same year, during the time of a funeral, there arose a vapor from the coffin of a person recently buried, and of 120 persons who were present, 114 were taken ill with a putrid fever. A similar occurrence is said by Dr. Robertson to have taken place, some years ago, in West Linton; a school-boy, getting into a new made grave, set about to open the projecting corner of a coffin, which as soon as he had penetrated, there issued from thence a strong nauseous smell, on which he exclaimed he was suffocated; on being removed from the place, he recovered from the first effects, but was immediately seized with a petechial fever, of which he died on the seventh day.* A pestilential fever occurred at Paris, on clearing the burying ground belonging to the church of the *Innocents*.

It is related by Sir John Pringle, that the greatest number and worst cases of jail or hospital fever, were in one of the

* Robertson on the Atmosphere and Epidemics, Vol. II. p. 341.

ships, in which there happened to be two men with mortified limbs; this accident was not only the means of spreading the infection at sea, but also in the wards in which they lay after their removal.*

Besides Pringle, Ramazzini, Porteus and others, who have written on the diseases incidental to armies, have considered the offensive effluvia of the excrement of man and beast, as a powerful cause of those putrid diseases which often prove so destructive to soldiers in encampments and fortified places.†

To the excessive use of animal food, and to the putrefaction which took place about their camp, we may reasonably ascribe the dreadful plague with which the children of Israel were afflicted at Kibroth-hattaavah, (or the graves of lust;) when, despising the manna that fell from heaven, they longed for the luxuries of Egypt and the flesh of beasts.—The sacred historians inform us, that "the mixed multitude that was among them fell a lusting; and the children of Israel also wept again, and said, who shall give us flesh to eat? We remember the flesh we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlic: but now our soul is dried away; there is nothing at all, beside this manna, before our eyes." * * "And there went forth a wind from the Lord, and brought quails from the sea, and let them fall by the camp, as it were a day's journey on this side, and a day's journey on that side, round about the camp, and as it were two cubits high on the face of the earth. And the people stood up all that day, and all that night, and all the next day, and they gathered the quails; he that gathered least gathered two homers, (240 bushels,) and they spread them all abroad for themselves round about the camp." In the conclusion of this account, we are informed by the sacred writer, that "the Lord smote the people with a very great slaughter."‡

Cases of yellow fever are said to have been produced in the West Indies by the putrefaction of a quantity of herrings.§

An occurrence similar to the preceding, and from the same cause, is related by Dr. Kollock, of Georgia, to have taken place in an American frigate, on her passage from

* Diseases of the Army. p. 68.

† In using the phrase *putrid diseases*, I merely speak in conformity to the opinion and phraseology of others; the doctrine of putridity will be treated of hereafter.

‡ Numbers, chap. xi.

§ Med. Repository, Vol. III. p. 409.

Newport to Havana.* And in the Medical Commentaries, Vol. VI, p. 248, the reader may find a similar instance recorded.

The deleterious operation of fœcal exhalations, is mentioned by Dr. Mitchill, as exemplified in the blacks who were employed in removing those offensive accumulations in the city of New-York, in April, 1800. The effects were catarrhs, inflammation of the eyes, pains in the bowels, griping, tenesmus, bloody stools, or dysentery, to which was added a febrile commotion in the constitution, of various degrees of violence, sometimes terminating in death.† We are informed by the same gentleman, that the inspector general of beef and pork in the city of New-York, examined, during the summer and autumn of 1799, several thousand barrels of corrupting meat. (I pass over the Doctor's speculations on septic acid.) Of those forty men, thirty-eight, the inspector general himself being one, were affected with dysenteries, of various degrees of violence, besides which, a considerable part of them were affected with catarrhal symptoms, nausea and fever.‡

The mortality which took place in the Dutch army, whilst it was besieged by the troops of Java, is stated by Bontius to have been occasioned by the dead bodies of the soldiers which were thrown into the river, and corrupted the waters. The air was likewise tainted with the putrefying carcasses of men and beasts that had died of famine and wounds, and lay unburied in the fields, in consequence of which, a malignant fever and dysentery were occasioned.§

* Med. Repos. Vol. IV. p. 1.
† Ibid, Vol. III. p. 409.
‡ Ibid, p. 309–10.
§ Bontius on the Diseases, Natural History, &c. of the E. Indies.

CHAPTER II.

OF THE NATURE, ORIGIN AND CONTAGION OF ENDEMIC FEVERS.

SECTION 1.

Of the Nature and Origin of Endemic Fevers.

These are subjects upon which much has been said, but to how little purpose may be learnt from the great diversity of opinion that still prevails. It may appear arrogant in me to attempt to settle a dispute which has been discussed with so much learning and ingenuity by individuals, societies, colleges, and councils; but as long as facts, common sense, the experience and observation of the intelligent and judicious, are my authorities and guides, I may reasonably hope of gaining the attention of the unprejudiced and impartial, who give their confidence and assent, not to the mere adventitious circumstances of rank, authority and number, however imposing, but to the demonstration of reason, and the evidence of truth.

In the preceding chapter, the causes of endemic fevers have been pointed out, as arising from the putrefaction of animal and vegetable substances, operated upon by heat, moisture and exposure to the atmospheric air. To establish and illustrate this point, a number of facts were adduced, and references made to different authors for a fuller and more satisfactory confirmation of these circumstances; from which it appears, that the general agreement of experienced physicians has established, as an unquestionable fact, the noxious influence of these external and remote causes of endemic fever. This may be considered as an important step in the progress of medical science, advanced upon sure ground, and from which there seems to be no danger of receding.

It will be readily understood, that the results of putrefaction will be modified in their nature, according to the diver-

sity of substances subject to the decomposing process; and which will consequently cause a difference in the effects which they occasion. A further difference will arise from the degree of virulence and concentration in those noxious exhalations themselves, as influenced by the degree of heat and moisture, and the quantity of corruptible materials to be acted upon. The mildest degree of their operation seems to be that whereby they occasion catarrh, and slight febrile affections, with disorders of the stomach and bowels; the next, is that of intermitting fever, then mild remitting, bilious remitting, yellow malignant, pestilential fevers, and plague. Between these extremes there are a variety of degrees and modifications of symptoms and appearances; but under whatever names the disorders thus produced may be known and designated, as there is a similarity in their causes, so is there an affinity or identity in their nature.

Where animal bodies are confined in a close unventilated apartment, the various excrementitious matters that are constantly escaping from them, either by respiration, perspiration, or otherwise, must, by warmth and stagnation, undergo putrefaction, and in the end be productive of disease;* but as in this instance the materials operated upon are different from those of ordinary putrefaction in the open atmosphere; so likewise, are the morbid symptoms resulting therefrom. We know that the small and close apartments of a prison, which have been a long time inhabited by their unlucky inmates, become very offensive to the smell from the degree of putrefaction which has taken place in the filth of their confined habitation: and instances are recorded of persons being suddenly infected with disease from exposure to such noxious effluvia, though the health of the prisoners themselves had not been thereby deranged. The exemption of the latter, and the infection of the former, are to be ascribed to the influence of habit, diminishing the sensibility of the system to stimuli and agents gradually increasing, and habitually and constantly applied. The circumstance of the butchers in Philadelphia remaining uninfected during the mortality of the yellow fever in 1793, is to be explained upon the same principle. This circumstance is illustrated upon a larger scale among the native inhabitants of hot climates and unhealthy situations, who are much less subject to disease than emigrants and strangers lately arrived: in the former, the fever, where it occurs, assumes the character of

* This putrefaction of perspirable matters is exemplified in the offensive smell which a pocket handkerchief soon acquires in the summer season.

a mild remittent, whilst in strangers it puts on the terrific and malignant aspect of the bilious yellow fever.

Upon the subject of contagion, we know that some diseases are contagious, and that others are not contagious; the small pox, chicken pox, measles, lues, &c. belong to the former denomination; scrofula, rickets, diabetes, gout, &c. to the latter. But there is a family of disorders, which some essayists contend are contagious, and others aver with equal confidence that they are not contagious; besides which, there are still others who hold, that the diseases in dispute are, or are not contagious, according to circumstances. Any disease that may be communicated from one person to another, whether by contact or through the medium of an intervening substance is understood to be contagious. Thus whether the disorder is received from inspiring the breath of an infected person, or by smelling or wearing the clothes of one who has died of the disorder, it is equally the effect of contagion. But as in epidemics it is impossible to trace every case to either of these causes, it has been maintained by some, that the infection introduced into a town or country propagates itself by the power of fermentation; that is, by converting a portion of the atmosphere to its own nature; but as without some limitation, such an effect would extend itself *ad infinitum*, it is supposed that a certain condition of the atmosphere was necessary to this process; just as warmth and humidity in flour are required to give efficacy to the fermentative quality of leaven, enabling it to communicate its own properties to the whole mass. Again, say they, the effect must be limited to the contagion of a particular disease; thus if the atmosphere is disposed to the fermentation of the yellow fever, it would be in vain and without effect to introduce the contagion of the small pox or plague; nor, if the atmosphere was disposed to the fermentation of the plague, would the introduction of the contagion of the yellow fever have any influence in checking its progress or changing its action. For both the propagation of the plague and yellow fever, it is contended that a foul air is necessary; but then this foul air must be of a particular quality, so as to dispose it either to a pestilential fermentation, or a yellow fever fermentation. In this way they endeavour to account for the prevalence and propagation of the yellow fever, &c. without having recourse to the processes of animal and vegetable decomposition, as produced by heat and moisture. Thus it appears that an unknown variety and concurrence of circumstances are required for the production of these dreadful epidemics, and that though

every other cause conspire, yet if the fatal leaven is not applied no danger can possibly arise. Thus ten thousand dead horses, and filth of every description, operated upon by a summer's sun, may taint and infect the air with their suffocating and offensive stench, yet if the *leaven* is not introduced no evil consequences need be apprehended.

From this opinion of atmospheric *fermentation*, however plausible and satisfactory it may be to its advocates and supporters, I beg leave to differ: 1st, because the supposition appears to be entirely gratuitous and unphilosophical; we have a notion of the fermentation of vegetable juices, of flour and water, &c.; it is, however, the vegetable matter in these substances undergoing partial decomposition and forming new combinations, that causes such fermentation; but we have no instance of the fermentation of gaseous substances; oxygen, hydrogen, nitrogen and carbonic acid may be mixed and mingled in any quantities and proportions, yet their qualities remain the same; no fermentation, either vinous, acetous or putrefactive takes place: 2d, because the introduction of such a supposed ferment can seldom be traced or ascertained, even by the advocates of this hypothesis themselves: 3rdly, because other circumstances are sufficient to account for the production of endemic, yellow fever, or plague without the supposed influence of this undiscovered and impalpable *ferment* and *leaven*. For if a foul or impure atmosphere is necessary, even according to this doctrine of fermentation, for the propagation of these diseases, how is this impurity of the atmosphere to be accounted for, unless from animal and vegetable decomposition, as occasioned by heat and moisture:* but if it can be shown that the yellow fever has ever originated in the midst of winter, when all decomposition was suspended, it will then be conceded that other states of the atmosphere, besides that produced by putrefaction may give rise to this disease: but the admission of this impure state of the atmosphere, which even the doctrine of fermentation supposes, renders the supposition of the introduction of any extraneous *leaven* entirely superfluous. For whether is it easier to imagine the adventitious presence of this particular leaven, or to account for the different appearances and modifications of the

* That other impurities of the atmosphere may exist independent of those caused by putrefaction is readily admitted: this seems to have been the case in the production of the winter or spotted fever of the northern states.—This fever and its causes, however, do not fall within the scope of the present subject of inquiry.

disease from the different degrees and combinations of heat, moisture and corruptible materials?

If it be contended that the yellow fever is a specific disease, invariably marked by a peculiarity of symptoms, it may be answered that no two authors have ever given the same account of this disorder, or discribed the same set of symptoms; but represent it as being so diversified by difference of climate and season, as never to appear under the same form. The yellowness is admitted by most authors not to be characteristic, and the other symptoms are equally variable and uncertain. Even admitting the yellow fever to be specific in its nature, it is not more so than a tertian intermittent, which is universally considered as arising from noxious exhalations. If a *ferment* is necessary for the production of yellow fever, why is it not equally necessary for that of the fever and ague? If the latter is produced without the agency of any such fermentation, what reason have we to suppose the existence and operation of any such principle in the production of the former? It would be a mere waste of time to attempt the further refutation of an opinion so perfectly visionary and unsubstantial.

The exotic parentage and imported contagion of the yellow fever is another opinion necessarily maintained by the advocates of the preceding doctrine of *leaven* and *fermentation:* who contend that the contagion is imported from the East Indies, Turkey, Africa, and the West Indies, by successive propagation: but what if the inhabitants of Turkey and Africa should maintain that it was imported to their country from America, and should enforce a system of quarantine against our vessels, as we do against those of the West India Islands? They could certainly trace the introduction from America with equal facility as our Cis-Atlantic fraternity scent the infected breeze from the shores of Africa.

And what are the circumstances in those remote countries necessary to the origin and prevalence of epidemics, as the yellow fever and plague? These have been already pointed out under the head of causes. It was there shewn that heat, moisture and putrefaction were invariably the antecedents and attendants on those fatal disorders. What but a concurrence of similar circumstances is necessary to produce similar effects in any situation? The effects will be in proportion to the causes: wherever the degree of temperature is highest, concurring with a greater proportion of moisture and corruptible materials, there also will prevail the most malignant disorders. I speak of the epidemics of summer

and autumn, and such as arise from an obvious concurrence of the external causes already mentioned. We accordingly find that wherever the yellow fever, as it is improperly called, has prevailed in our country, there has been a remarkable combination of the circumstances which we have noticed. A defective police; the accumulation of filth; a long continuance of hot weather, during which the pestilential atmosphere was not dissipated by salutary breezes, produced the yellow fever in Philadelphia in 1793. Similar causes concurred to give rise to the same disorder in New York and various other places at subsequent periods.

The fact is that the yellow fever, or to speak more properly the bilious malignant fever, is the natural offspring and production of a widely extended country; comprehending in its circle the torrid and considerable portion of the temperate zone: viz. Africa, the East and West Indies, the South Europe and Asia, a considerable portion of South America, and its extent and prevalence in various parts of North America are too well known to require to be particularly mentioned here. Wherever its essential causes, heat, moisture and corruptible materials exist in the greatest degree, there will bilious and endemic fevers prevail with the most malignant fatality. The more temperate or cold the climate, the less subject will it be to bilious fever; and on the contrary, the hotter the climate, and the more marshy and abundant in putrefying materials, the more subject will it be to this disease. These are truths which may be said to be as immutable as the laws of nature. Was the yellow or bilious fever ever known to exist in the frigid zone, in Lapland, Sweden, Norway, Denmark or Greenland? No, and for an obvious reason, because the heat of these countries is never sufficiently great or long continued to produce the necessary degree of putrefaction and decomposition. As we approach the equator, we observe the disease more frequent and malignant; until arriving at the tropicks, we there find it existing as a permanent epidemic.

Having shown the insalubrity of low and marshy situations, and of towns and places abounding with putrescent and corruptible materials, it scarcely appears necessary to point out the circumstances and situations opposed to the evolution of noxious effluvia, and the consequent production of fever. The peculiar healthfulness of high, dry and hilly situations, remote from marshes, rivers, and stagnating waters, has been universally observed, as well in the southern portion of the United States, as also in the West India islands and the tropical parts and sea coast of South Ameri-

ca. So well are the inhabitants of towns, cities and settlements situated upon the sea coast and rivers in the United States convinced of this fact, that families of competency and fortune in unhealthy places, annually leave their winter residence upon the approach of hot weather and retire to the hills in the country, remote from stagnating water and sources of putrefaction, and return again in the fall, after the appearance of frost has suspended the process of decomposition, and purified the atmosphere. In this way they avoid the infectious sources of disease.

The successive and gradual change in the salubrity of the climate of St. Domingo, in receding from the sea-coast to the more interior and hilly parts of the island, is well represented by Dr. Jackson, who observes,* that "In most situations on the sea-coast, the character of the endemic is strongly marked; in the wet or unhealthy season, the febrile form of disease chiefly prevails; in the spring and earlier part of summer, more particularly under slight and accidental rains, diarrhœa is not uncommon. In higher situations, on the first chain of mountains, intermittents or diarrhœa are frequent in wet weather, sore legs are troublesome at other times. In situations still more interior, on the mountains, or in the valleys lying under the second chain of mountains, intermittents and diarrhœa, though occurring occasionally, become gradually more rare; sore legs take their place, and appear actually to be the endemic disease of that tract of country. In the highest situations, or on the central ridge, neither fevers, fluxes, nor sore legs are known, at least they occur so seldom as not to deserve notice." The same author remarks,† that the form and degree of endemic disease follows nearly the same rule in Jamaica, as in St. Domingo. The character of endemic fever is strongly marked at Spanish Town and Kingston; diarrhœa has its season, but sore legs are of rare appearance. At Stony Hill, intermittents and diarrhœa occur sometimes, but the fever is seldom of a dangerous kind; sore legs are frequent, and of difficult cure. At Maroon Town, fevers and fluxes are not often seen; but sore legs are not uncommon. It may be presumed, though not yet ascertained by trial, that in still higher situations, sickness and sore legs will be as little known, as they are on the central ridge of the mountains of St. Domingo." The healthiness, in the West Indies, of hilly situations, remote from marshes and sources of

* Outline of the History and Cure of Fever, p. 90.
† Ibid, p. 93.

putrefaction, is also attested by Dr. Davidson, in his letter to Dr. Rush.* "I have mentioned (says the Dr.) an instance of the remarkable good health which the 66th regiment enjoyed at St. Vincents for several years, upon a high hill above the town, removed from all exhalations, and in a situation kept at all times cool by the blowing of a constant trade wind. They did not lose, during eighteen months, above two or three men."

As to the degree of northern latitude to which yellow fever has extended, in the United States it has prevailed in Boston, situated in lat. 42, 22, N. and in the various sea-ports to the south of that city on the coast of the United States. Endemic fevers, of a malignant character, originating from heat, moisture and putrefaction, in European countries, have been mostly confined to the coasts of Spain, Italy, the islands of the Mediterranean, the sea-ports of Greece, and the southern coast of the Black Sea, scarcely exceeding the 42d degree of north latitude.

I am aware, however, that fevers of a malignant nature, approaching nearly in character and degree to the yellow fever of the United States and the West Indies, have, on some occasions, prevailed as far north as the 52d degree of north latitude, at Walcheren, Lynn, Breda, Delft, in different parts of Flanders, Hungary, and other districts and situations where the land is low, wet, and abounding with stagnating water. In such places, an unusual continuance and degree of warm weather through summer and autumn, may produce intermitting and remitting fevers of an aggravated and malignant character, differing only in degree from the yellow fever of North America and the West Indies. Thus the fever which prevailed in Lynn in 1779, and the five following years, was considered by Dr. Robert Hamilton to be of the same nature as the yellow fever of the West Indies as described by Dr. Hillary; the tertian of Minorca by Cleghorn; and the remitting fever of Bengal by Clark.

In the production or origin of yellow fever, it will be proper to remark, that a greater degree of heat will compensate for a less quantity of corruptible materials, and the greater abundance of the latter, will make up for a less degree of the former: but where both abound in excess, there the epidemic will be liable to prevail with the greatest malignancy. Consequently the bilious or yellow fever, as it is called, may and does originate in any place where there is sufficient heat, moisture and corruptible materials, whether

* Rush's Inq. and Obs. Vol. IV. p. 253.

on the sea-board or in the interior of the country. Thus it has been known to prevail with as great fatality in the interior of the states of New-York, Pennsylvania, Ohio, and all the southern states, as in any of the large sea ports of the United States. The difference is, that wherever the bilious yellow fever makes its appearance in any populous city, particularly of the northern states, where the disease is more rare and terrific. the deaths which take place produce an alarm among the panic-struck inhabitants, disproportionate to the real cause and grounds of apprehension. At Salina, in the interior of the state of New-York, the bilious yellow fever prevailed in the summer of 1822, with greater mortality than in the city itself, where it had produced the most alarming consternation, and where the affrighted populace were flying with precipitation from the presence of this terrific epidemic. Whilst, at the same time. at Ballston and Saratoga they were totally exempt from this disease, notwithstanding their want of quarantine laws, and the great numbers that were constantly thronging to those fashionable places of resort from the city of New-York, the very seat of infection. How will the advocates of imported and exported contagion account for all this? Must they again be driven to their far-fetched hypothesis of fermentation? One part of their explanation is involved in so many difficulties, that it may fairly be set aside on their own grounds. And as for the yellow fever making its appearance in the interior of a country, without the aid of importation, though it should be attended with every symptom of this fatal disease, yet as it cannot be traced to a foreign origin, they consequently will not admit it to be the yellow fever. The prevalence of the yellow fever at Salina without the aid of importation, and the exemption of Ballston, notwithstanding the free communication with the infected city, is to be accounted for, from the physical condition of the two places. Salina, the place of the salt works, being a low, flat, wet situation, abounding in ponds and stagnating water; from which evils Ballston and Saratoga are in a great measure free.

In proof of the importation of the yellow fever, it has been said that it is confined to sea-ports; whereas, it is well known, as already stated, that this disease has frequently appeared in inland situations, where its introduction from abroad could not possibly be suspected; having, at various times and places, prevailed in the interior of the states of New-York, Pennsylvania, Ohio, Virginia, North and South Carolina, Georgia, Alabama, &c. in none of which was its

introduction from a foreign port ever suspected by the inhabitants.*

If it be contended that the yellow fever is the natural endemic of the West Indies, and thence introduced into the United States, I would ask what circumstances necessary for its production in the West Indies do not abundantly exist in various parts of our own country? The heat of the southern parts of the United States is equal, during the summer season, to that of the tropics. The degree of temperature in the northern states is seldom sufficiently intense and long continued to occasion its production, consequently it is there a less frequent disease.

Dr. Pinkard, speaking of the yellow fever, says, "To look for it in ships and vessels, or to strain the eye across the ocean, in order to fix its birth place on the opposite coast of the Atlantic, or to trace its descent from the shores of the Indian seas, were to overlook the reality in search of a phantom. It needs no foreign parent; the prolific earth is its mother, its father the bright god who governs the day."

If the yellow fever is an imported disease, why was it never introduced into Philadelphia during the interval from 1762 till 1778? At the time here alluded to, there were no quarantine regulations to serve as guardians to the public health; and a regular, extensive and uninterrupted intercourse was maintained with the West India islands. "The appearance of the yellow fever," says Dr. Ed. Miller, "in many of the interior parts of the country inaccessible to foreign contagion, confirms the opinion of its domestic origin, while it entirely invalidates that of its importation.—There is not a state in the Union, which has not offered evidence of the production of this disease, in situations where importation was impracticable. In the course of the season of 1805, a malignant fever, in all essential points the same as our yellow fever, prevailed in many parts of this state, (New-York.) and occasioned more mortality, in proportion to the population of the district, than took place in this city. There can be no reasonable doubt, that the disease called

* For facts relative to this subject, I refer the reader to the following authorities: Ellicott's Voyage down the Ohio. Dr. Watkins' communication in the Medical Repository, Vol. IV. p. 75. Account of the Black Vomit and Dysentery in Mifflin county, Penn. Ibid, p. 105. Dr. Blond's Observations on the Yellow Fever of the valley of Patia, in South America. Ibid, Vol. VIII. p. 75. The Rev. Mr. Black's Account of the Yellow Fever of Bethlehem, Con. in 1750. Ibid, Vol. II. p 88. Dr. Scott on the Yellow Fever of Gennessee Co. N. Y. Ibid, Vol. X. p. 248. Some of which have been already partially quoted in a preceding part of this treatise.

the *lake fever*, in the interior of this state, possesses all the essential attributes of the yellow fever."*

Can we suppose that nature is so uncertain and changeable in her operations, as not to produce analogous effects from similarity of causes? Is it more difficult and unphilosophical to suppose the domestic generation of a pestilential disorder, than that an epidemic should be imported from a foreign country, where disease under a different character existed? Plants and animals may be exported and propagated in a land foreign to their parental country; but disease is every where connected with physical causes and with the frail constitution of the human frame. The very elements are in a constant state of conspiracy against man's health and existence; and the same sun that warms and cherishes the seasons, and restores renovated verdure and beauty to the vegetable world, dispenses with the boon of plenty the pestilential principles of disease and death. Trace nature in her work of destruction from Bengal to Batavia, from Batavia to Africa, from Africa to Syria, from Syria to Constantinople, thence to Egypt, the West Indies, and to the United States, and in every country we shall find nature working by the same laws and modes of operation, the same agents and principles of disease, and a similarity of disorders.—Shades of difference in the diseases, like the varieties in the human figure and complexion, are observable in each. But as human nature, though disguised under the uncomely exterior of a negro, is human nature still, so endemic fevers, however diversified in appearance, are yet allied in every essential circumstance.

The plague has prevailed at various times in different parts of Europe, Asia and Africa, from the 29th to the 56th degree of north latitude. By the term plague, I merely allude to diseases which have gone under that denomination, and not to any specific disorder invariably marked by the same set of symptoms: and by this appellation I understand an epidemic fever of a highly malignant and fatal character. Diseases vary in their features according to diversity of seasons and situations; and the presumption is, that in what is called the plague, there is as great a variety of symptoms, as there is between the endemic bilious fevers of the United States and those of the East Indies. It has been formerly remarked, that a greater quantity of corruptible materials will compensate for a less degree of heat, and that the excess of the latter will make up for the compara-

* Report on Yellow Fever. Life of Miller, p. 118.

tive deficiency of the former. We are hence enabled to explain how diseases, strictly the offspring of hot climates, may sometimes spring up in more northerly latitudes. In this way, we may account for the prevalence of pestilential fevers in London, during the fifteenth century, though situated in the 51st degree of north latitude; in Marseilles, in the 43d degree; and in Moscow, in 1771, in the 55th degree. These diseases, though like the yellow fever, more common to the south of Europe and the north of Africa, yet, under favorable circumstances, set geographical limits at defiance.

According to the account of Sir James M'Gregor, in his Medical Sketches of the Expedition to Egypt, the plague is subject to as great a diversity of symptoms as the bilious fever; depending on variety of season, situation, and other circumstances. When the disease first appeared in the Indian army, the cases sent from the crowded hospitals, were, from the commencement, attended with low typhoid symptoms. The cases of this disease which occurred when the army was encamped near the marshy ground of El Hamed, were all of the intermittent and remittent type; those which took place in the cold rainy months of December and January were of an inflammatory character; and towards the end of the season, at Cairo, Ghiza, Boulac, and on crossing the isthmus of Suez, the disease appeared under the aspect of a mild continued fever.

"You would be astonished," says Lady Montague, "to find that the plague is nothing but a fever." And Dr. Russell, in his account of the plague of Aleppo, says "it commenced in the suburbs in the form of a remitting fever."

"Why should it surprise us," says Dr. Rush, "to see the yellow fever generated amongst us? It is only a higher grade of a fever which prevails every year in our city, from vegetable putrefaction."*

The scientific and judicious Dr. Ed. Miller, in a letter to Dr. Rush, dated Dover, November 5th, 1793, observes, that "from the uncommon protraction and intenseness of our summer and autumnal heats, but particularly from the unusual drought, we have had, since the middle of July, a near approach to the tropical season, and that of consequence, we ought not to be surprised if tropical diseases, even of the most malignant nature, are engendered among us." In enumerating the symptoms of this disease, he remarks, that "bile discharged in uncommon quantities constantly assumes the most corrupted and acrimonious appearances, common-

* Rush's Inq. and Obs. Vol. III. p. 208.

ly eruginous in a very high degree, and sometimes quite atrabilious."*

When the materials of disease are diffused and intimately blended with every portion of the air that is received into the lungs by respiration, it is vain and nugatory in the extreme to search for the general calamity in individual sources of contagion. Where all breathe the same impure and infected atmosphere, all are liable to the prevailing disease, no matter whether they remain secluded in their houses, inhale the open atmosphere, or are exposed in their attendance upon the sick and the dying. Admitting that the air of the apartment of a patient laboring under yellow fever may be more corrupted and impure than the external atmosphere, we know that all contagions by dilution and diffusion lose their virulence, so as to be incapable of producing disease at a short distance from the patient's body.—This law applies even to the small pox, the most contagious of all diseases. Dr. Haygarth, though an advocate for imported contagion, is yet satisfied, from observation, as to the limited sphere of its operation. "I have proved," says he, "by facts, that the sphere of variolus infection, in moderate cases does not extend in the open air to the distance of half a yard, and in the worst, but a few yards from the poison.† The same rule, he thinks, applies to the American pestilence, or yellow fever.†

We are informed by Dr. O. Ryan, that he placed a person in the eruptive fever of the small pox by inoculation at about half a yard from four children properly prepared; each exposure continued an hour, and was repeated daily for a fortnight, till the pustules had become perfectly dry, and that not one of the four received the infection.‡ An instance equally striking is mentioned by Dr. Odier. "At Geneva," says he, "we have frequently inoculated a great number of children during the years when the small pox was not epidemical. These children went about every day even after the eruption had appeared. They were sent into the streets, and the public walks, and have communicated freely with children, who were susceptible of infection; yet the small pox did not spread by this intercourse. There even did not come to my knowledge an instance clearly proved of the infection being communicated to a single individual, either in the streets or public walks."

* Rush's Inq. and Obs. Vol. III p. 203.
† Haygarth on Small Pox, p. 161.
‡ Dissert. sur les Fievres Infect. et Contagieuse.

Dr. Rush was of opinion that the vapors from marshes might extend to the distance of two or three miles; others are equally liberal in their calculations. Such conclusions, however, seem to have been adopted without sufficient investigation of the subject. To whatever distance noxious vapors may extend, it is not probable that they are in general capable of producing disease at a greater distance than two or three hundred yards from their source, and the probability is, that they fail in their effect short of this calculation. When the epidemic prevails over a large extent of country, it must be evident that no certain conclusions can be formed upon the subject. For although there may be insulated spots, which in themselves might prove healthy, on account of their physical exemption from the local causes of disease, yet being surrounded with an impure atmosphere on every side, highly charged with miasmata, every wind which blows must dissipate the poison, and waft it to a distance more or less remote from the place of its generation. It has been remarked, however, that dilution destroys the infectious and morbific quality of noxious miasms, and as they must become more and more diluted by diffusion, and proportionably weakened by mixing with the general atmosphere, they must consequently soon lose their noxious and infectious properties. We are informed by Dr. Blane, that when the ships, in watering at a place called Rock Fort, anchored close to the shore, so as to smell the land air, the health of the men was affected; but that upon removing two cables length no inconvenience was perceived.*

We are told by Lancisi, that at Rome the south-east wind, termed by the Italians *sirocco*, which passes over the adjacent marshes, is most unsalutary; and yet the effects of this wind have been experienced to extend only to those parts of the city which lie nearest to the marshes, occasioning there an epidemic fever, whilst the rest of the city remained free from infection..

On several occasions, when the fever, or plague, as it was called, raged in Rome, it was confined to the low grounds along the margin of the Tiber, leaving the drier and more elevated parts of the city unaffected; and it was a matter of astonishment to Baglivi, the medical historian of the times, that so short a distance should make such a difference in the qualities of the air.

* Blane on the Diseases of Seamen, p. 229.

It is observed by Dr. Lind, that when the British squadron, in the months of July and August, 1744, lay off the mouth of the Tiber, one or two of the ships which lay nearest to the shore began to be affected by the pernicious effluvia from the land; whilst the others lying further out at sea, at but a very small distance from the former, were entirely exempt from disease.* Dr. Lind thinks, that in the open air the sphere of infection does not extend beyond fifty or sixty feet from its source.

We are informed by Dr. Rush, that the yellow fever has never been known to pass from Philadelphia to the Jersey shore; and the miasmata generated on the east side of the Schuylkill rarely infect the inhabitants on the opposite side of the river.†

Desgenette says the infection of the plague never crosses the Nile, and that its progress is arrested by means of ditches, dug and filled with water for the purpose.

It was remarked by Dr. Whitman, that the plague never passes the Dardanelles at Constantinople, from Turkey to Europe.

Many persons escaped the plague which prevailed in London in 1665, by flying to the ships which lay in the middle of the Thames. And we are told by Dr. Rush, that no instances of yellow fever occurred in those families in Philadelphia that confined themselves to ships in the middle of the Delaware in the year 1793.

As to the extent of contagion, it is remarked by Dr. Walker, that the contagion of small pox, measles, jail fever, and even of the plague itself, being emitted from a body or from fomites, in which the infectious particles are lodged, daily observation shows, that contact, or a very near approach to the source of infection, is absolutely necessary to propagate the disease.‡

"If one speaks of an infected person," says Howard, "shut up in an unventilated chamber, it may be said that the whole atmosphere is dangerous; but if one speaks of a patient exposed to the open air, it has been proved that the sphere of infection does not extend above five geometrical paces from his body. Beyond this distance, one is in safety."§

"The sphere or origin of contagion," says Dr. Jackson, "appears to be very confined; a general epidemic disease

* Lind on the Diseases of Seamen, p. 66.
† Inquiries and Observations.
‡ Walker on Small Pox, p. 481.
§ Howard's Account of Lazarettos, p. 34.

cannot easily be supposed to result from it; a direct communication, or near approach to the source being necessary." The same author, in his remarks on the medical department of the army, observes, that in the West Indies, "the dread of imported contagion is a bugbear; the fact (*opinion*) of importation in the manner alleged, is not supported by one authentic history, and it is not consistent with the nature of things."

Even Dr. Chisholm, one of the most strenuous advocates of contagion, admits that a person may safely enter the chamber of the sick, provided he avoids coming in contact with the patient or bedding; and thinks that the infectious effluvia at most do not extend to a distance of more than six or ten feet.*

If such is the difficulty with which malignant and infectious diseases are propagated by contagion, how are we to account for the prevalence of epidemics? Surely not upon the principle of contagion. How are we to account for the simultaneous appearance of the small pox, in different parts of the same town or district, and in persons who have never approached or seen a patient laboring under the disease? How are we to account for its sudden appearance and its as sudden decline, unless by referring it to a general cause existing in the atmosphere, requiring not the precarious and equivocal intervention and aid of a diseased person and human contagion for its propagation? And how vain is the idea of exterminating this disease, when the causes of its origin are unknown? But there are other diseases with the origin of which we are better acquainted, and whose rise and progress are evidently connected with physical causes, which it is in our power to prevent or avoid. Such are the intermitting and remitting fevers, the yellow fever and the plague. But Dr. Chisholm, as sanguine, and more unreasonable in his conjectures with regard to yellow fever, than Dr. Haygarth is in relation to the small pox, cherishes the chimerical idea, that by the aid of quarantine regulations, the yellow fever will be completely exterminated.† In contradiction to this opinion I would observe, as a melancholy fact, that since the adoption of the system of quarantine in the United States, the yellow fever has been far more frequent, even in the sea-ports and cities where these regulations have been rigidly enforced, than it was previous to their adoption.

* Essay on the Malignant Pestilential Fever, p. 135.
† See his letter to Haygarth, p, 246.

I am not disposed to make the unqualified assertion, that the plague and yellow fever are absolutely never contagious, under all circumstances; analogy leads us to suppose that they may sometimes be communicated in this manner; and besides, if we may believe the reports of the contagionists themselves, there are well authenticated instances of sporadic cases having originated in this way: and though such an effect should not happen more than once in five hundred instances of exposure, yet the circumstance of its having once taken place removes the doubt as to the possibility of such an occurrence. It is obvious, however, that the contagious nature of a disease can never be determined in the impure and corrupted atmosphere to which all are equally exposed. When each individual is enveloped in the common miasms of disease which fill the atmosphere of the infected town or settlement, it is altogether gratuitous and absurd to say, that such a person caught the complaint from visiting or attending the sick. The power of communicating the disease can only be determined by removing the patient to a healthy atmosphere; if in this situation persons take the disease from visiting or attending the infected, the disorder may then be pronounced to be contagious; but if no such communication of disease takes place, we are bound, by every principle of reason and common sense, to pronounce the disease absolutely uncontagious.—The latter has been the general experience in bilious or yellow fever; of which there are but very few unequivocal cases on record of its ever having been communicated in a pure atmosphere: and even the few that are recorded rest upon the partial testimony of the prejudiced and avowed advocates of contagion. But even admitting that on some rare occasions a person has caught the disease from coming in contact with the sick, receiving his breath, or by wearing, handling, or washing the clothes of a person who has died of the yellow fever, or by vapor from a bale of cotton, old clothes, or other substances, such instances go but a little way in the production of an epidemic.

Upon this subject the ancients had more rational ideas than many of the moderns. Hippocrates, the father of physic, and Sydenham the leader of medical improvement in Europe, have explained the general prevalence and diffusion of epidemics by attributing them to a certain noxious constitution of the atmosphere. Since the days of Sydenham a similar opinion has been adopted by many of the most eminent physicians, who have written on the subject, among whom we may mention, Boerhaave, Van Swieten,

Mead. Hoffman, Ramazzani, Haxham and De Haen. In what this constitution or quality of the atmosphere consists, they do not pretend to inform us; though Sydenham supposes it to be an exhalation from the bowels of the earth. After a revolution of so many years it is curious to see this opinion revived in our own country by Mr. Webster. From the observations that have been already made, and from what remains to be advanced upon the subject, we shall, I think, be able to account for the origin of the diseases under consideration upon more rational and satisfactory grounds, and to establish the fact of their causes as arising from sources less mysterious and occult than the *bowels of the earth.* Such an origin, however, suited the hypothesis of Mr. now Dr. Webster; who has endeavoured to prove that epidemics are connected as causes and effects, with the appearance of comets, the eruption of volcanoes, and the convulsions of earthquakes; that pestilence is disseminated from the fiery tail of a passing meteor, and that yellow fever, small pox, &c. are vomited forth with the fire and brimstone of Etna and Vesuvius.

Though plague was formerly supposed to be a specific disease, originating, in every instance, from morbid poison perpetually existing, yet this, like the yellow and other fevers which derive their source from animal and vegetable decomposition, has been ascertained by the experience and observation of numerous physicians to arise from local causes.

Whether the other species, varieties, or forms of fever, such, for instance, as are not so evidently connected with obvious causes, as the spotted and malignant fevers which have of late years made their appearance during the winter and spring, in different parts of the United States, as also the small pox, measles, influenza, &c. whether these derive their origin from different modifications of the same causes, is a question which does not come within the scope of my present inquiry, nor does it admit of being so easily determined. But the query may be suggested whether these disorders may not arise from morbific miasmata, the result of animal and vegetable decomposition existing in the atmosphere, and variously modified by the season of the year, and the state of the weather, as it respects heat and cold, humidity and dryness? Or may not the spotted or winter fever arise from some change in the elementary part of the atmosphere itself? As a diminution of oxygen and a disproportionable increase of nitrogen, from the consumption of the former, affected by the processes of respiration and

combustion, the latter of which is very considerable during the winter season, and which by withdrawing the vital portion of the air occasions a disoxigenation of the blood, and by this abstraction of stimulus, producing direct debility in the system, or causes the formation of a *tertium quid* with a portion of the fluids destructive to animal life.

From the evident connexion which is frequently observed to exist between epidemics characterized by diversity of symptoms, we are led to suspect an affinity and analogy in the causes which produce them. Such a connexion has long been observed; and whilst it enables us to trace the simple operation of nature in bringing about the complicated appearances of effects, it serves to break down the wall of partition which separated them by the unnatural and arbitrary laws of human compulsion. Judging only from the most striking and remarkable features, without considering the less visible but more immediate and important clue of connexion, physicians have been led to infer that a diversity of symptoms was sufficient to establish a radical difference in epidemical diseases. Though in natural history the animal kingdom may be classed according to the external resemblance of the individuals which compose it; yet in the pathological arrangement of diseases, the rules and principles of art must yield to the less obvious, though no less certain laws and principles of nature: here the classification should be made, not upon the capricious concurrence of a similarity of symptoms, which are perpetually changing, but upon a knowledge of the proximate cause. Until this is ascertained, the classification of diseases must continue arbitary and defective.

The most common precursors of the more malignant epidemics are measles, catarrh, influenza, angina, and hooping-cough, which are also apt to appear upon the decline of the more malignant disease. Nor does an epidemic often arise without a progressive order and increasing malignancy in the diseases which have preceded it. This precursory epidemic is of longer or shorter duration according to circumstances: and it appears from the London bills of mortality that malignant diseases were generally increased in number and violence during the spring months which preceded the plague in 1625, 1630, and 1665. The same thing has been remarked in many instances, where the yellow fever has prevailed in different parts of the United States.—The bilious yellow fever of Philadelphia in 1793, according to the account of Dr. Rush, was preceded by the influenza and the milder forms of bilious fever. The same disease in

1794 was preceded by obstinate intermittents. "From the inflammatory complexion of the diseases of the spring, and of the beginning of June," says Dr. Rush, "I expected the fevers of summer and autumn would be of a violent malignant nature. I was the more disposed to entertain this opinion from observing the stagnating filth of the gutters of our city; for the citizens of Philadelphia having an interest in rejecting the proofs of the generation of the epidemic of 1793 in their city, had neglected to introduce the regulations which were necessary to prevent the production of a similar fever from domestic putrefaction."* The same observation was made by Dr. Caldwell.† We are informed by Dr. Bailey, that the epidemic which prevailed in New-York in 1796, was preceded by angina trachealis, attended with anomalous symptoms, cases of obstinate dysentery, and by febrile disorders accompanied with bilious evacuations. Early in July, these facts were noticed at a meeting of the medical society; and the society, from the conviction of something uncommon in the state of the atmosphere, came to the resolution of making particular observation on the nature of the diseases which might occur previous to their next meeting, but in the mean time the growing disorder declared itself in the unequivocal character of a prevailing epidemic.

Most persons, and especially physicians of observation, have remarked, that when bilious or yellow fever of an inflammatory character has prevailed in summer, the fevers which succeed in the winter partake of the same character, are attended with bilious discharges, yellow skin, &c., but are distinguished by this remarkable peculiarity, that the inflammatory symptoms are of short continuance, being suddenly succeeded by typhus. From their rapid disposition to assume the typhoid character they are often more fatal than the diseases of summer, and without impropriety may be called the pestilence of winter, sometimes denoting an epidemic of the succeding summer. The same aggravation of disease from the cold of winter has been observed of the small pox. It was remarked by Sydenham, that in those years in which the small pox was epidemic and mild, it usually began about the vernal equinox; but when it was epidemic and of a dangerous kind, it usually began in the month of January, seizing whole families, and sparing none

* Rush Inqu. & Obs. vo. 3, p. 358.
† Appendix to Alibert on Malig. Intermit. p. 44.

of whatever age or sex they might be, unless they had previously passed through the disease.*

Lord Bacon, who lived at a period when the plague was frequently epidemic in England, observes, "the lesser infections of the small pox, purple fever, agues, &c. in the preceding summer, and hovering all the winter, portend a great pestilence of the following summer, for putrefaction rises not to its height at once."†

We may remark this connexion of malignant diseases with the universal plague, which prevailed successively in 1635, 1636, and 1637. The progress of these diseases is distinctly traced by Diemerbroeck. He remarks, *Chapter de Peste*, that "the spring of 1653 was warm and moderately humid; to which succeeded a very hot dry season, in which appeared many malignant epidemics. In the first place a severe plague broke out at Leyden, by which more than 20,000 persons were destroyed. At Nimeguen, in Guilders, and other regions, a certain pestilential fever spread with dreadful mortality. In autumn, severe heat still continuing, with excessive drought, many other malignant diseases appeared, as small pox, measles, diarrhœa, and dysentery of a very bad type; but more especially the above mentioned purple fever, called in Italy *petechial*, increased in extent and violence, until it had turned into the true plague.‡ He further remarks, that from November, through the winter, scattering cases of plague occurred at Nimeguen: that in January, 1636, it increased, and in March spread and became epidemic; rose to its height in April, and continued till October.

The circumstance of spotted fever gradually assuming the character of plague, until at length it became converted into the plague itself, seems to be fundamentally opposed to the doctrine of specific contagion, as essentially necessary for the propagation of this disease: and contradicts the opinion of Doctors Mead, Cullen, and others, who contend for its specific nature.§ "The fact," says Dr. Webster, "is

*Swan's Sydenham, p. 96.

† Bacon's Works, vo. III p. 59.

‡ Donec tandem in apertissimam pestem transieret.

§ I here make my acknowledgments to Mr. Webster, for directing my attention to some useful and interesting references It may be proper to inform those who are unacquainted with the circumstance that Mr. now Dr. Noah Webster has written a work in two volumes octavo, for the purpose of proving that epidemics owe their origin to the appearance of comets, the convulsions of earthquakes, and the eruptions of volcanoes. Though there is much visionary speculation in this performance, the reader is, in some degree compensated for his trouble, by the many interesting facts which the learned author has recorded.

undisputed. In the distressing period from 1569 to 1677, when Europe was almost depopulated by the spotted fever, physicians observed that the disease frequently ran into the plague and the plague into the spotted fever. The same fact was often noticed by authors of the 16th and 17th centuries, in which the plague frequently overran Europe. These two diseases are, therefore, two distinct forms or modifications of pestilence, probably bearing an affinity to each other, like that between the distinct and confluent small pox." "This fact," says the same author, "shows that the distinction made by medical writers, between *pestis* and *pestilentia*, the plague and pestilential distempers, however useful in practice, is not authorized by truth and philosophy. The ancients classed all contagious epidemics together, and denominated them *pestilence*, and this distribution, in regard to their causes and origin was doubtless most philosophical."*

The same connexion is noticed by Reverius in his *Praxios Medendi*, lib. 17. "Many deadly diseases," says he, "accompany the prevalence of pestilence; as phrenitis, anginas, pleurisies, peripneumonies, inflammations of the liver, dysenteries and many others." And Bottinus, after describing the circumstances connected with the origin of the plague, as impure air, bad food, intemperate seasons, &c., says its invasion was preceded by epidemic diseases, such as petechial fevers, small pox, measles, dysentery and epidemic pleurisy.† The universal prevalence of malignant distempers, which immediately preceded the plague of 1565, was noticed by Sydenham with his usual accuracy. "I never knew," says he, "pleurisies, quinsies, and other inflammatory diseases, more common than they were some weeks preceding the plague in London in 1665." Those inflammatory diseases which prevailed in the winter and spring, yielded as the season advanced and the weather became milder to a malignant fever, which appeared as the immediate precursor of the plague; into which it changed by such insensible degrees that Sydenham himself was at a loss to determine whether that fever was the plague or not; and what appears as a convincing argument of their being but different degrees of the same disease, is the circumstance noticed by Sydenham, that when the plague in autumn began to abate, the same malignant fever reappeared.‡—

* Webster on Epidemics, vo. 2, p. 62.
† De Febribus, p. 265.
‡ Sydenham, vo. I. p. 122, 136.

Which is but saying that as the season progressed, the disease lost by degrees its pestilential character of glandular swellings, and became less malignant. The same facts are noticed by Hodges and Morton. In 1719, the year before the great plague in Marseilles, a pestilential fever broke out in the city, which, in some cases, was attended with buboes and carbuncles. From which it appears that the plague actually began six months previous to the pretended introduction of infection from Syria. We are informed by Dr. Russel, that the plague which appeared in Aleppo, in 1742, was preceded by an acute fever; and after the disease abated in July, diarrhœas and dysenteries of malignant type, attended in many cases with petechiæ, made their appearance; as likewise intermittents, which often proved fatal.—These diseases, in their acute forms, prevailed also with the plague, which at this season was less malignant than usual, nor did it predominate to the entire exclusion of other diseases. The dreadful plague which prevailed at Messina in 1743, and which destroyed two thirds of its inhabitants, was immediately preceded by a malignant fever. One physician alone, out of thirty three, pronounced it the plague; but the others denied it, because the disease was not attended with glandular swellings. A similar fever preceded the severe plague at Venice in 1576, and the physicians and magistrates were at first embarrassed with the same uncertainty. The terrible pestilence which raged at Naples in 1656, was ushered in by its usual precursor, a malignant fever; one physician alone pronounced it the plague, and for his presumption, the Viceroy condemned him to imprisonment. The extensive pestilence which from 1759 to 1763 spread its destructive ravages over all the countries and islands of the Levant, was every where preceded by a similar increase of malignant diseases; and more especially by the petechial fever which prevailed at Aleppo in the year preceding the appearance of the disease, under the full marked character of the plague. "Yet Patrick Russel, the author of this account," (says Mr. Webster, who refers to this circumstance, with his usual dryness,) labors very gravely to trace the disease to the Turks from Egypt, and their old clothes. The malignant disposition of diseases at certain times was noticed by Hippocrates. "There are times," says he, "when almost all the diseases which occur are extremely malignant and as generally fatal; so that coughs, pleurisies, anginas, are all equally fatal." He assures us that the truth of his observation has been confirmed in countries very remote from each other, and in a variety of seasons

and climates. The plague of Aleppo in 1742, which first showed itself in the suburbs in April, was preceded in March by an acute fever. Schenkius says that the plague of 1574 was preceded by malignant fevers. "In the same manner," says he, "small pox, measles and dysenteries are very often the precursory heralds of the plague." Those epidemic influenzas and catarrhs which frequently prevail over extensive districts of country, we are often unable to trace to any change of temperature, or prevalence of dampness:— They therefore seem to be connected with some secret cause in the atmosphere itself, independent of cold or humidity. Between these diseases and the measles there is an evident affinity, not only in their nature and symptoms, which require a similiarity of treatment in both, but likewise in the cause or causes from which they originate; as satisfactorily appears from their preceding and following one another as epidemics. This circumstance, and the evident connexion which exists between epidemics in general, are well illustrated by Dr. Webster. "In the year 1772," says he, "the catarrh and measles raged in the same year, from Boston to Charleston. To these succeeded anginas and dysenteries for a series of years. In 1781 and 1782, catarrh pervaded the globe. In 1783, began measles in May, and anginas in August. In 1789, measles preceded the influenza. In 1757, influenza preceded the measles." The same author, speaking of the plague in Europe, says, "At the same time raged in America a series of epidemics, particularly measles, anginas, and the bilious plague; the latter appearing in Philadelphia and Virginia in 1741, and in New York in 1743, in the same year with the dreadful pestilence of Messina. The plague appeared in Philadelphia in 1762; and the fatal epidemic pleurisy in 1761."*

Dr. Rush divides the patients affected with yellow fever in 1793 into three classes, according to the progressive malignancy of the symptoms. In the third he includes all those in whom the miasmata acted so feebly as not to confine them to their beds or houses; of these he says some died, who conceived their complaints to be occasioned by a common cold, and neglected to take proper care of themselves, or to use the necessary means for their recovery.† The connexion of intermitting fever and scarlatina anginosa was observed by the same author in 1789. "The intermitting fever," says he, "which made its appearance in August, was

* Webster on Epidemics, Vol. II. p. 108.
† Inq. and Obs. Vol. III, p. 137.

not lost during the month of September. It continued to prevail, but with several peculiar symptoms; in many persons it was accompanied with an eruption on the skin, and a swelling of the hands and feet. In some it was attended with sore throat, and pains behind the ears. Indeed, such was the prevalence of this contagion which preceded the scarlatina anginosa, that many hundred people complained of sore throats without any other symptom of indisposition. The slightest exciting cause, and particularly cold, seldom failed of producing the disease.*

The tendency which epidemics have to confound themselves with each other by prevailing at the same time, was accurately noticed by Dr. Sydenham; and the fact has since frequently been observed by others. Dr. Bard, speaking of the malignant pleurisy at Huntington in the year 1749, says the distemper was brought into the city when the eruptive fever was epidemical; and immediately the small pox was propagated by inoculation in a great many different parts of the town, whilst the constitution of the air which favored the eruptive fever, was at its height. The consequence of which was, that so long as the symptoms of the small pox appeared from inoculation, the then prevailing constitution of the air changed its symptoms, in a great measure, to its own likeness; most of the characteristic symptoms of the preceding fever, accompanying those of the small pox; until by degrees the small pox, spreading over the city, extinguished the eruptive constitution, and then existed in its own simple form; after which inoculation was practised with its usual success.†

A less degree of the same causes which give rise to the more aggravated forms, will produce the intermitting fever; and in the southern states it is not unusual to observe, in the progress of the season, the successive degrees of increasing malignancy, from the simple intermittent to the bilious or yellow fever with black vomit.

Every accurate observer has remarked the striking connexion which exists between what is called yellow fever and the inferior gradations of endemics, down to the intermitting fever itself. Indeed, one of the most frequent terminations of the yellow fever of the southern states, is in the intermitting fever; which is often a more obstinate disease than the former: nor is it uncommon for the intermitting to change its character to that of the yellow fever. This I

* Inq. & Obs. Vol. I. & Vol. III. p. 145.

† American Medical and Philosophical Register, Vol I. p. 420.

have frequently observed; and in times of the general prevalence of bilious fever, I have made it a point to stand upon my guard against such insidious and deceitful appearances; for if neglected, after one, two or three repetitions of the paroxysms of fever and ague, the disease is apt to become continued, and to assume the most malignant aspect. A disease, which at first would have yielded to venisection, an emetic, cathartic, or a few doses of Peruvian bark, by neglect, becomes converted into a case of malignant and fatal yellow fever. All these different grades of disease prevail at the same season; and the fever appears under different characters and types, according to the constitution of the subject, the degree of predisposition, and the force of the exciting causes.

Dr. M'Lean observes, that he has "often seen the intermittent commence the attack, and repeat its form for one or two paroxysms, and afterwards, as the cause gained strength, assume the remittent shape, and prove fatal." He further remarks, in another place, that after all the instances of the yellow fever which he has witnessed, and all the attention he could pay to it. he is of opinion it is the common remittent of the West Indies, rendered formidable by being applied to the English constitution; that the variety which appears in its progress depends entirely on the variety of the several constitutions which it attacks; and that the yellowness which gives it a peculiar name, only marks its worst stages, and is rather an accidental than a peculiar characteristic.*

Dr. Robert Jackson, speaking of the diversity of aspects which is often assumed by the endemic fever of the West Indies, makes the following observations.† The cause of endemic fever, continued, remitting, or intermitting is one, but great variety is produced in the form and manner of action. The disease, in the more violent forms, is, or appears to be continued in some situations, in others, it is remitting and of regular type. In wet weather and on swampy grounds, the endemic of the country is usually remitting in form; and under this form, exhibits appearances of jaundiced yellowness, of black vomiting, purgings of black matter, hæmorrhage from different parts of the body, petechiæ, lividness, &c."

* M'Lean's Inquiry into the Nature and Causes of the great Mortality among the Troops in St Domingo. Lond. 1797. p. 73 & 86.

† Outline of the History and Cure of Fever, p. 202.

It is said that during the prevalence of the yellow fever in New-York, in 1798, every grade of disease, from the mildest febrile affection to the most malignant and pestilential was exhibited in the course of the epidemic. Except in a few instances, however, the number of mild cases greatly predominated over the malignant. Some assumed the character of intermittents, and yielded to a very slight treatment; more appeared under the form of remittents, without any symptom of malignity, and speedily yielded to the proper remedies. As a proof of the affinity and resemblance existing between this epidemic and the plague, we are informed that cases of anthrax and buboes were observed; that one patient was affected, for twenty-four hours previous to his death, with spasms of the pharinx, neck, back, and arms; exhibiting the combined horrors of tetanus and hydrophobia.*

It is remarked by Dr. Caldwell, that the yellow fever of Philadelphia in 1805 was preceded by intermittent fever, diarrhœa, and dysentery.†

It is remarked by Dr. John Hunter, that the fevers of the West Indies are similar to what are called the marsh and remittent fevers in Europe, only more malignant; and arise from the same causes, viz. noxious exhalations from low, wet and marshy grounds.‡

It was observed by Dr. Rush, that the epidemic of Philadelphia in 1802, assumed four principal grades, viz. the intermittent, the mild remittent, the inflammatory bilious fever, and the malignant yellow fever; all of which, in many instances, ran into each other. "A tertian," says he, "has ended in death, with the black vomiting; and a fever with the face and eyes suffused with blood, has ended in a quotidian, which has yielded to a few doses of bark."§ In the further prosecution of the subject of the relation between the regular tertian, or the fever and ague, and the yellow fever, he remarks, "The bilious fever indicated its descent from this parent disease. I met with many cases of regular tertians, in which the patients were so well on the intermediate days as to go abroad. The tertian type discovered itself in some people after the more violent symptoms of the fever had been subdued, and continued in them for several weeks."

* Med. Repos. Vol. II. p. 198-9.
† Essay on the Yel. Fev. Appen to Alibert on Malig. Intermit. p. 44.
‡ Hunter on the Diseases of the Army in Jamaica, p. 15.
§ See his letter in the Med. Repos. Vol. VI. p. 169.

Cases of intermittent, remittent, and typhus fevers, were observed to prevail at the same time in the same family, by Dr. Trotter. The remote causes of those fevers appeared to be the same in all, viz. a cold, damp house, and deficiency of diet. The same thing was observed by Dr. Trotter in the navy and in the public hospitals. A similar observation was made by Mr. Crawford, that on board of every ship, at the time the yellow fever was the most fatal, there were a number of cases of intermittents. Mr. Crawford was of the opinion that the cases of intermittents originated from the contagion of the patients laboring under the yellow fever.* A more probable presumption is, that they all originated from a common cause, viz. heat, moisture and putrefaction.

The different quantities and degrees of heat, moisture, and corruptible materials, in different places, will occasion a corresponding diversity in the endemic of the same season. As the causes of disease in large cities generally exceed those of the adjacent country, we can easily account for the greater severity and malignity of symptoms in the endemic of the former than that of the latter situation. This circumstance is ably represented by Dr. Edward Miller, in the following words: "As the materials of putrefaction and the degrees of heat, in a large city, greatly exceed what is found in the adjacent country, so the diseases arising under such circumstances must be proportionably more malignant. The pestilential fevers of our city (New-York) differ only in grade from the bilious and remittent fevers of the country. They prevail in the same climates; they come on at the same season of the year; they are chiefly disposed to attack persons of the same constitution; they commit their ravages on the same organs of the body, and produce symptoms differing only in degree; and they decline and disappear at the same season and under the same circumstances. In the city we often see in the same family, and under equal circumstances of exposure, the malignant forms of pestilence and the mild forms of remittent fever; and in the country, while the great mass of cases are generally mild, we occasionally meet with some which exhibit the violent attacks, the intense malignity, and the rapid dissolution, which more frequently mark the pestilential fevers of the city.†"

We are informed in Sir George Staunton's Account of the Embassy to China, that the malignant fevers of Batavia ended in the tertian form.

* Trotter's Med. Narr. Vol. I. p. 185, and Vol. II. p. 99.
† Report on Yellow Fever. Life of Miller, p. 92.

From the survey which has been taken of the nature, origin and causes of epidemic and endemic fevers, it will be seen that there is a general analogy, and a chain of connexion, observable in the whole, from the mildest form, or intermitting fever, to the more aggravated grade, under the name and character of plague. What has been considered the most characteristic feature of this disease, viz. the appearance of glandular swellings, buboes and carbuncles, takes place but in a small proportion of cases. Such affections have likewise been observed in the yellow fever; so that from every consideration we are led to conclude that the plague is nothing more than a high grade of endemic fever, marked with some peculiar symptoms of malignity; and like the yellow or bilious remittent fever, owing its origin entirely to local causes.

It should be considered as a subject of regret that no name more appropriate and generally applicable than that of *yellow fever*, has been selected to designate the endemic of our country; since the yellowness of the skin is by no means an inseparable characteristic of the disease. In many malignant and fatal cases, as well as in those which terminate in recovery, this symptom is never observed. Dr. Moseley, speaking of the endemic fever of the West Indies, remarks, that "yellowness of the skin, like black vomiting, is not an invariable symptom of this fever: those who are fortunate enough to recover, seldom have it; and many die without its appearance." Besides, yellowness of the skin takes place in other diseases. An epidemic is mentioned by Haller, in which the body turned yellow.* We are informed by Lasonne, in the Medical Commentaries, that he sometimes observed it in a disease occasioned by putrid cattle: and Dr. Lind mentions its occurrence in several cases of typhus. There are instances of jaundice accompanying fits of the intermittent fever in England. And Dr. Hunter observes, that he has seen two examples of yellowness or jaundice in the hospital, or jail fever.† This symptom can only be considered as an indication of redundancy of bile in the primæ viæ; which may, or may not, according to circumstances, be absorbed and conveyed into the circulation in such quantity as to produce a yellow suffusion on the surface of the body. That the bile is absorbed and conveyed into the blood in yellow fever, there can be no doubt; and we are informed by Dr. Lind, that he found the serum of

* Haller Opera. Monor. Vol. III. p. 374.

† Hunter on the Diseases of Jamaica, p. 91.

the blood of a patient laboring under this disease to be bitter.* "I have seen," says Dr. Monro, "the eyes, the skin, with the urine, as deeply tinged by the bile, in typhus, as I have remarked it in the yellow fever of the West Indies."†

The yellow, or bilious fever, is called by the French, *La Maladie de Siam*, from its being frequent in the kingdom of Siam, in the East Indies. They also call it, *La Fievre Matelotte*, or Sailor's Fever, on account of strangers and seafaring people being most subject to it: and the Spaniards call it, *Vomito Preto*, or the black vomit, from one of its dangerous and alarming symptoms. Hillary calls it *the putrid bilious fever;* by Chisholm it has been styled the *malignant pestilential fever;* Mosely denominates it the *endemial causus*, identifying it with the *febris ardens* of Hippocrates, Aretus and others; by Towne it is termed *febris ardens biliosa*. To most of which appellations there are objections, inasmuch as the disease is by no means invariably characterized and attended by all the symptoms, respectively, from which it has received its distinctive appellation. A name of more universal application than any other, is the *bilious remitting fever*. As a redundancy of bile is one of its most inseparable symptoms, a name expressive of this circumstance must, consequently, be considered more appropriate than any other which is less constantly observed. It is true that a redundancy of bile is sometimes observed in other fevers, though so seldom as not to afford a material objection to the term *bilious*, as applied to the endemic fever of hot climates.

But it is contended that there is a specific distinction between the bilious remittent of hot climates and the yellow fever. To affirm and to prove, however, are very different; and when one disease is so much like another in its causes, symptoms and cure, that no difference can be detected, we are bound, by the rules of common sense, to consider them as the same. It is admitted by the contagionists that in Mobile and New-Orleans the yellow fever has prevailed: I have witnessed the diseases of both places, and I have also seen the endemic fever in various parts of the states of Alabama, Florida and Louisiana, and I can with truth affirm, that between the more aggravated forms of fever in all these places, there is not a shade of difference.

As a characteristic of the yellow fever, it has of late years been contended by some physicians, particularly by Dr.

* Lind on Fever and Infection, p. 13.
† Monro on the Diseases of the Army, p. 259.

Pym of England, that the disease attacks the *human frame but once.* If such were the fact, however, in relation to the yellow fever, it is strange that a circumstance so striking was never received as a principle in medicine previous to the time of Dr. Pym. In relation to the small pox, the knowledge of this fact is coeval with that of the disease; but from ancient, modern, and universal experience, we are bound to reject the application of this law to the yellow fever. The object of the abettors of this doctrine, is to establish the specific nature of the yellow fever, as differing essentially from all other forms of simple fever. But in relation to the subject of contagion and the specific character of diseases, the opinion is nugatory and unavailing; for what disease is more contagious and specific than the venereal? which is, at the same time, unlimited in the number and repetition of its attacks upon the same individual. Truths which have long been established by observation and experience, are never indebted to speculation and hypothesis for their authenticity; but fictitious facts, created with a view of supporting a favorite opinion, like that of Dr. Pym, bear upon their front the stamp and evidence of their own inanity.

In all parts of our country where the yellow fever has prevailed, its origin has been easily traced to local causes. The local origin of the yellow fever of New-York in 1795, is satisfactorily accounted for by Dr. Bailey. In his letter to the Rev. Richard Canning Moore, he gives us the following information.* Such was the filth and accumulation of putrefying materials on the south side of Pearl street, between Old Slip and White-Hall, that the poisonous exhalations which abounded in that quarter, during the warm weather in the beginning of August, so changed the air, that the disagreeable effluvia frequently obliged the inhabitants, especially in the evening, to close the windows on the south side of their houses; and, in several instances, the offensive smell was such as to occasion vomiting in those who were exposed to the exhalations. The wharf on which Mr. Delafield's stores were erected, we are told, was in a state truly execrable, and the slips on the right and left were in a condition little better. "These, and such places," says Dr. Bailey, "are visited by the *dock fever—the yellow fever*, if you please, that murderer of our own creating." These noxious and offensive effluvia, he informs us, were evolved from putrefying substances, among which were dead dogs,

* Philad. Med. Mus. Vol. I. p. 50 & 51.

cats, horses, and other noxious matters, collected from the streets, and deposited for the purpose of filling up the unfinished docks. "New-York," continues the Doctor, "as I have said before may be rendered as healthy a city as any under the sun; and when a more rigid police prevails, and the nuisances with which this city abounds are corrected, you will hear no more of the ravages of pestilential diseases."* To this description of the local causes of the origin of the yellow fever in New-York, as given by Dr. Bailey, may be added, that many of the streets in the lower part of the city were crooked, narrow, and dirty, and, at the time here alluded to, badly constructed; without any regular drain for the water, which stagnated in holes and puddles in the streets, and in the back yards of the houses, especially where the streets had been raised, and the adjoining lots left upon their original level, forming, as it were, a sink or basin of putrid water and the corruptible refuse of the kitchens.

Dr. Jameson, in his observations on yellow fever,† remarks, that in all the epidemics he has seen in Baltimore, and which may be considered as caused by miasmata, all the circumstances considered essential in the production of bilious fever, were most obviously present; these were, made grounds in marshy situations; foul wet cellars; hot dry weather, succeeding to wet springs productive of luxuriant vegetation; together with a number of days in which Fahrenheit's thermometer rose above 80 degrees.

Dr. Rosset, in a letter to Dr. Miller, gives an account of a pestilential fever which prevailed at Wilmington, N. C. in 1796; which he considers as having originated from local causes, from the circumstance of the state of the weather, the effluvia of adjacent marshes, and its not being traceable to any foreign source. But, notwithstanding its malignancy, no instance could be discovered of its being communicated by contagion. "A few cases," says Dr. Rosset, "of our common fall fever, every year put on all the symptoms of a violent fever.‡"

It appears from the account of Baron Laray, that there is but a shade of difference between the yellow fever and the plague. The causes which produced the yellow fever among the wounded in Egypt, were the crowded state of the hospitals, the situation of the camp, on the west side of Cairo, being low and moist, more especially after the waters

* Med. Repos. Vol. I. p. 119.
† Medical Recorder, Vol. VI. p. 435.
‡ Med. Repos. Vol. II. p. 144.

of the Nile had receded from a place where they had undergone putrefaction from long exposure to the heat; the sudden transition from the scorching heat of the day, to the moisture of the night, to which the troops were exposed, tending to weaken the body, and to predispose to, and to excite the disease; and the heat and damp of the atmosphere, in the season of the Kamsyn. "At this time, also," says Laray, "the plague prevails, and we might say that the yellow fever, from the similarity of its effects, and its speedy termination, has some analogy to this scourge."

The same remark has been made by the celebrated Dr. Humboldt, who has seen these two diseases, the plague in Turkey, Syria, and Africa, and the yellow fever in New Spain and Vera Cruz. "Indeed," says Laray, "if we compare the phenomena of the two diseases when they are acute, and attack persons of the same age, and of the same sex and temperament, we shall find in the first stage that the anxiety, the restlessness, and inquietude of the patient, the pains in the head, the loins, and hypochondria, the vomiting, the redness of the conjunctiva, the burning heat of the intestines, the dryness of the skin, the hardness and frequency of the pulse are, with some varieties, nearly the same in the plague and in the yellow fever. In the second stage, the prostration, the accession of delirium, the total suspension of the animal functions, indicated by the dyspnœa, nausea, the suppression of the alvine evacuations, and afterwards involuntary and colliquative discharges and irregularity of the pulse, are also symptoms common to these two diseases. In this stage, the one is distinguished by a yellow color, which appears and extends over the whole surface of the body; the other by livid spots, petechiæ, carbuncles, or buboes, which may likewise occur in the yellow fever, but much more gradually; buboes and carbuncles seldom occur, but petechiæ frequently in the third stage of the disease."*

From all which, and from what Assalini has said upon the same subject, we may gather that what is called the plague in Egypt is nothing but the common endemic fever of the country, liable at certain times, as in other places, to slight changes of features. Assalini describes the endemic fever of Egypt as one disease, and makes no distinction into yellow fever and plague, a distinction in all probability without a difference. With the same propriety, the physicians of our country might agree to call the endemic attended with one set of symptoms the plague, and with another the

* Laray's Memoirs, Amer. Edit. Vol. I.

yellow fever; but whether designated by the term plague, yellow fever, malignant pestilential, bilious remittent, seasoning fever, or any other, it is all the same disease, with the same remote and proximate causes, though diversified in aspect, by peculiarities of seasons and situations, the constitution of the patient, and the strength or weakness of the remote causes. And had not Baron Laray been so wedded to the nosology of the schools, as to be unwilling to give up the specific character of the plague, he would have viewed the disease in the same light as represented by Assalini.

Dr. Mitchell, in a letter to Dr. Duncan, dated New-York, 16th November, 1798, among other symptoms of the yellow fever, which then spread terror through the city, mentions the appearance of buboes and carbuncles.*

Similar glandular affections were observed by Dr. Rush and other physicians in the yellow fever of Philadelphia in 1793.† Anthraces, buboes, and carbuncles have likewise been observed in the yellow fever of the West Indies.‡ The frequent appearance of these local affections have procured for the yellow fever of America, in its more malignant character, the appellation of the western plague. (*Pestis Occidentalis.*)

Col. Wilson, on the subject of the plague of Egypt, makes the following remarks. He says that the plague has long been supposed to have been brought from Turkey in the ships charged with old clothes, which constantly came to Alexandria for market. "But the plague," says he, "has been generated annually in Egypt during the last four years, (although no such communication has been possible,) and even chiefly communicated in Upper Egypt. In Cairo, last year, forty thousand people were supposed to be infected with the plague, and many of the French garrison in that city died, although the disease was treated in their hospitals with the greatest ability. In Upper Egypt, 60,000 of the inhabitants perished during the same season. Three whole villages were swept away, and remained abandoned when the Indian army descended the Nile."

If we take into consideration the physical condition of the country, we shall find enough to answer our purpose in accounting for the origin of the plague in Egypt, without

* Duncan's Annals of Medicine, Vol. IV. p. 340.

† Rush's Inqu. & Obs. Vol. III, p. 124.

‡ See a letter from Dr. George Davidson, dated Fort Royal, Martinique, Sept. 20, 1796, to James Mease, M. D. resident physician of the port of Philadelphia. Med Repos.

ascribing it to the old clothes imported from Constantinople.

The principal source of disease in Egypt was represented in chapter 1st, section 5th, to be the annual overflowing of the Nile, leaving, on its subsidence, a quantity of putrid matters exposed to the action of the sun, filling the air with putrid and offensive vapors; to which were added the filth and poverty of the inhabitants; their small, ill ventilated and dirty houses; crowded, narrow and filthy streets, &c.

I here subjoin a short review of Prosper Alpinus' work, *De Med. Egyptior. lib.* 1, in relation to the plague of Egypt; for which I am indebted to the Medical Repository, Vol. IV. page 195. Alpinus informs us, (cap. 13.) that an almost infinite number of Egyptians, impelled by poverty and want, fed upon the worst kind of aliment, and drank muddy and putrid water, at Cairo. The Mahometans used wine very commonly, and got drunk as well as the Christians and Jews. The houses of that city are very high, and are constructed so as to shelve over the streets, and exclude sunshine and light. (cap. 6.) At Alexandria, pestilential fevers happened almost every autumn, and were more destructive to strangers than to the natives. (cap. 14.) P. Alpinus takes up almost a page in enumerating local causes of this disease, such as the corrupt exhalations from Lake Mareotis and its neighborhood; from low places and sunken holes in the city itself; from the water of the Nile conducted to the town, drawn off into stagnant reservoirs, kept during the year for family use, sometimes growing poisonous before it was consumed, and used in this condition for cookery and drinking, &c. He mentions the canal of Cairo as an abominable nuisance, as becoming charged with abundance of putrefying things, changing from green to black, and becoming horribly stinking, and destroying the lives of persons living near it. He describes the diet of the poor, (in a society where almost all are poor,) as consisting of muddy and corrupted water, and half rotten beef, camel's flesh, fish and cheese, eaten by them because they are cheapest, and because they can buy no other. After all this, Alpinus admits, though with seeming reluctance, that the pestilential contagion may be engendered from putrefaction, in certain places, after the waters of the swollen Nile have withdrawn. But he thinks, upon the whole, the contagion is commonly imported, either from Greece, Syria or Barbary, and that the contagion from Barbary is by far the worst!! It rages from September to June, and then stops spontaneously, when the Etesian or cool northerly winds begin to blow.

It was the practice of the ancient historians, as medical writers to give the denomination of plague to all epidemical diseases which proved remarkably destructive; and Mr. Ceresole, one of the physicians of Bonaparte's army, relates that the word *koubeh*. in Arabic, which, in English, is translated *plague*, is a general denomination applied to every violent and malignant disease. Desgenettes, the physician general of the French army in Egypt, informs us, that in Egypt they generally confound all pestilential fevers, which are exceedingly various, with the plague properly so called: which like all the advocates for contagion, and the peculiar specific nature of diseases, he considers as a very circumscribed species.* The truth is, says the editor of the Medical Repository, there is no proof of the existence of such a specific disease as the *pestis* of nosologists, and the plague of the commercial nations of Europe. The accounts they give of it are imperfect in some respects, and fictitious in others. The fevers of Asia and Africa, like those of America, take on a hundred different forms, arise from the like causes, and die away under similar circumstances. If buboes, and hæmorrhages, and mortifications, are criteria of the plague, then we certainly have the plague in the United States.†

The plague which prevailed in Marseilles in 1720, originated from a scarcity of food, and was afterwards increased by the dead bodies which were left unburied in the streets. As soon as the disease was declared to be contagious, desertion, famine, disease and death spread desolation through the city. About a thousand corpses were daily thrown into the streets to putrefy, until at length a passenger could scarcely walk without treading on them: these, together with the putrefaction of dogs. which had been ordered to be killed, filled the air with their stinking and pestilential exhalations. This shocking scene of misery and destruction continued until towards the end of September. And when we take into consideration the extraordinary concurrence of causes, we are not surprised that out of a population of 80,000 inhabitants, 50,000 should have fallen a sacrifice to this pestilential mortality.‡

Ethiopia and Egypt, says Mr. Gibbon,§ have been stigmatized in every age, as the original source and seminary of the plague. In damp, hot, stagnating air, this African

* Un espece bien circonscrite.

† Med. Repos. Vol. IV. p. 194.

‡ See the Introduction to Assalini on the Plague, by the American publishers.

§ Hist of the Decline and Fall of the Roman Empire, Vol. V. chap. xliii.

fever is generated from the putrefaction of animal substances, (he should have added, *and vegetable*,) and especially from swarms of locusts, not less destructive to mankind in their death than in their lives. The fatal disease which depopulated the earth in the time of Justinian and his successors, first appeared in the neighborhood of Pelusium, between the Serbonian bog and the eastern channel of the Nile. Mr. Gibbon goes on to describe its progress over Syria, Persia, the Indies, Africa, and Europe. To pregnant women the plague was generally mortal: yet one infant was drawn alive from its dead mother, and three mothers survived the loss of their infected fœtus. Youth was the most perilous season; and the female sex was less susceptible than the male; but every rank and profession was attacked with indiscriminate rage, and many of those who escaped were deprived of the use of their speech, without being secure from a return of the disorder. "Besides its being propagated by the intercourse of war, the pestilential odour," says Mr. Gibbon, "which lurks for years in a bale of cotton, was imported by the abuse of trade, into the most distant regions."*

Yet Procopius himself, an eye witness, was satisfied that the disease could not be communicated by the closest conversation.† In opposition to this opinion of imported contagion, it should be recollected that the Romans, though they held no commercial intercourse with the rest of the world till after the subjugation of Carthage, were nevertheless subject to the ravages of the most destructive epidemics. As the causes of these, we need but refer to Lancissi's account of the marshes and noxious exhalations of the papal dominion, or to the descriptions given by Tacitus and Livy of the swamps and low grounds of the Roman territory.

"No facts," says Mr. Gibbon in a subsequent sentence, "have been preserved to sustain an account, or even a conjecture, of the numbers that perished of this extraordinary mortality. I only find," says our author, "that during three months, five, and at length ten thousand persons died each day at Constantinople; that many cities of the east were left vacant, and that in several districts of Italy the harvest and vintage withered on the ground." Those who were

* Mr. Gibbon, though well qualified to give interest and instruction upon every subject of general literature, was still, no doubt, a better historian than physician; and it appears evident that he had imbibed the prevalent European prejudices of his day in relation to the subject of contagion.

† Oute gar iatro, oute gar idiote.

left without friends or servants, lay unburied in the streets, or in their desolate houses. Such was the universal corruption of the air, that the pestilence which burst forth in the fifteenth year of Justinian, was not checked nor alleviated by any difference of the seasons. At times, its malignity was abated and dispersed; the disease alternately languished and revived; but it was not till the end of the calamitous period of fifty-two years, that mankind recovered their health, or the air resumed its pure and salubrious quality. The triple scourge of war, pestilence and famine, afflicted the subjects of Justinian, and his reign is distinguished and disgraced by a visible decrease in the number of the human race; a decrease which has never been repaired in some of the finest countries of the globe."

It is probable that if we possessed a correct history of this destructive epidemic, as it appeared in different countries, we should be able to account for its cotemporaneous prevalence in different places on philosophical principles; and might be able to trace it to a general cause, or pestilential state of the atmosphere, as influenced by heat, moisture, putrefaction and peculiarity of season, without ascribing it to the influence of contagion, which can never be admitted as the cause of epidemical diseases. Such, indeed, is the rational presumption which we should make, from what we observe in our own time of the simultaneous rise and prevalence of endemic fevers in different districts and sections of country, as well in America, as in the Eastern world.—The same season and circumstances that prove favourable to the origin of an epidemic in one place, will have the same influence in generating disease in a thousand different places at the same time: the circumstance is of easy and satisfactory solution, and the explanation is supported by philosophy and facts. We know that the plague which annually prevails in different parts of Turkey, Syria, and Egypt, arises from the physical causes which have been already noticed. In Rome we trace this disorder to the inundation of the Tyber, and to the marshes and low grounds in the vicinity of the city. In a season of excessive rains, we are informed, the Tyber swelled above its banks, and rushed with irresistible violence into the vallies of the seven hills. A pestilential disease arose from the stagnation of the deluge, and so violent was the infection, that four score persons expired in an hour in the midst of a solemn procession, which implored the mercy of Heaven.*

* Gibbon's Dec. and Fall, chap. XIV.

The plague has never been known as such on its first appearance, and its being preceded and intimately connected with malignant fevers is noticed by a variety of authors, who, prejudiced in favour of the specific character of the plague, look upon it as a peculiar and distinct disorder, different from the malignant fevers, its antecedents and successors; which, in truth are but inferior grades of the same disease. The circumstance of this connexion was observed by Diemerbroeck, in the plague at Niemeguen in 1635, and by Sydenham, in 1665: the same thing was observed in relation to the plague at Marseilles, (Traite de la Peste;) at Holstein, (Woldshmidt,) in 1764; and at Moscow, (Mertens,) in 1771. Morton, speaking of the poison that produced the remittent fever, which prevailed in London for several years previous to 1665, says, the poison having collected and increased itself in a wonderful manner, unexpectedly changed into the most dreadful and fatal plague.* The same gradual transition, or rather mitigation of symptoms, has been observed in the decline of the plague as in its aggravation, passing again into its former ambiguous character. The fevers, says Sydenham, which succeed a severe plague are in some instances of an aggravated and pestilential character; and, although destitute of some of the distinguishing marks of the plague, nevertheless, frequently represent its own nature and appearance, and also require a similar method of treatment. Sir John Pringle relates, upon the authority of Dr. Mackenzie, who had resided thirty years at Constantinople, that the annual pestilential fever of that place, is only called the plague when attended with buboes and carbuncles;† and, Dr. Russel informs us, that in Syria, during the winter and early part of the spring, the distinguishing marks of this disease, as buboes and carbuncles, are often absent.‡— We are told by Mertens, that a putrid fever had been epidemic at Moscow for three years preceding the plague; but, that as soon as the plague broke out, the fever ceased: or, with more propriety, it might be said, that as soon as they agreed to call the disease by the name of the plague, no other disorder was acknowledged.

Sydenham, speaking of the malignant fever which ushered in the plague of 1665, says that it assumed the very aspect of the plague, nor could it be distinguished from that disease, but by being less aggravated in degree.§ A similar

* In pestem funestissimam et dirissimam inopinate mutavit.
† Pringle on the Diseases of the Army.
‡ Russel on the Plague.
§ Nec ab ea nisi ob gradum remisiorem descriminatur.

observation has been made by Rothman, in his account of the plague at Stockholm in 1710; that the malignant fever differed from the plague in nothing but degree. Dr. Mead speaks of biles and painful suppurating tumors in the groins and axilla in the small pox. Glandular swellings were also noticed in the yellow fever in Philadelphia, in 1793; also, in the yellow fever of New-York, in 1798; and in several other instances. Sir John Pringle, Dr. Lind and Dr. Donald Monro, mention the appearance of the swelling and suppuration of the parotid glands in the malignant fevers which fell under their observation.

As the plague is nothing more nor less, than a highly malignant grade of fever, we can see no propriety in this particular distinction, either for the elucidation of its nature, or for the purposes of prevention and cure. Diseases of uncommon fatality have generally received the terrific appellation of the *plague*: thus an epidemic fever of a remittent type, at first divested of malignity, has, by the progressive severity of its symptoms and the mortality which attended its more aggravated form, at length received this dreadful and appalling distinction. In the year 1804, Spain suffered a diminution in her population of one million of inhabitants, principally from the bilious yellow fever, or plague as it was called. In Malaga, as early as the 11th of August, 1804, the deaths from yellow fever amounted to 50 a day.* On the 14th of the same month, the deaths had considerably diminished, and all the physicians of the place subscribed a written opinion in the following words before the magistrates. "We the undersigned physicians certify, that no epidemical disease prevails at Malaga at present. It is a sort of *ague* or *malignant fever*, similar to that which rages in many other parts of Spain; and it has of late so much subsided, that out of twenty people taken ill, only five died, whilst on the first appearance 15 out of 20. We hope that by the use of gentle medicine, and by taking the necessary precautions of fumigating the houses where the disease has existed, it will soon disappear." From the publications of that time, it appears that this *ague*, or malignant fever, was on the 18th of August called a *contagious fever*, and, as it still continued to increase in malignancy and extent, on the 22d they called it the *plague;* the number of deaths the preceding day having amounted to 148. As soon as the disorder was pronounced contagious and to be the plague, all intercourse between

*Med. Repos. vo. 8, p. 430. Malaga is situated in 36° 48'' N. L.

the town and country was prohibited. And such was the alarm and consternation of the people, that the tragic scenes exhibited at Messina on a like occasion, were acted over again at Malaga. At Messina we are told, that as soon as the sickness was declared to be the *plague*, the inhabitants were panic struck. There were no bakers to prepare bread, there were no labourers to dig graves, there were no nurses to attend the sick, and as the disease was deemed contagious, every person was afraid to touch another, and even to come near him. The people of the surrounding country refused to bring fruit or provisions to market, and guarded the roads leading out of town with so much strictness as to prevent the flight of the unhappy citizens into the country. The putrefying carcasses of the dead, lay scattered through the houses, heaped in the streets, and piled in large collections at the church doors. Such was the stench and horror produced by the putrefying carcases, that at length the furniture and wood work of the houses were carried into streets for the purpose of making fires to consume them. From these funeral piles, fire was several times communicated to the houses. Forty thousand persons, out of a population of 60,000, perished by this calamity.

The following extract of a letter, dated, Malaga, December 1804, will give some additional idea of the ravages of this disorder. "It is impossible to form a just idea of the aspect exhibited by our unfortunate city. It resembles a desert. The mortality here, has, in some measure ceased, it is true, for want of victims. Seven thousand persons only have escaped its attack; twenty-six thousand have fallen a sacrifice to it."

Dr. Valentine, in his essay on the yellow fever in Spain, in 1804, gives the following information concerning its fatality. "Malaga, which contained a population of 110,000, lost 26,000 by this pestilence." Sixteen cities and a number of villages suffered from this epidemic. At Carthagena, 14,000 died, out of a population of about 31,000. At Malaga, 26,050 persons we are informed by the London Monthly Magazine, for February 1805, were buried in the course of four weeks. By a letter from Mr. Kenning, surgeon of the royal artillery, to Dr. Rollo, published in the Medical and Physical Journal of London, for March 1805, we learn that one half of a garrison of soldiers, consisting of 12,000, stationed at Gibraltar, died of this disease. "The tenth regiment," says he, "have lost only two or three men of those who have been in the East Indies; and very few indeed of

their recruits recovered; which evidently shows that the climate has done more for them than medical aid.

It is worthy of remark, says Dr. Heberden,* how, according to the bills of mortality in general, but especially the spotted fever, always increased and decreased along with the plague. Of the former, there never died more than four in a week before the plague began; but afterwards the number frequently exceeded a hundred. Nor was this by any means peculiar to London. Diemerbroeck relates the same of the plague in the Netherlands; and Gorkelius is quoted by Brown, as having observed a similar occurrence; and more particularly Berwinkle, who was a physician at Hamburg during the plague, in the year 1714, who observes that the petechial fever and plague were frequently converted into each other, and that if the buboes retroceded, a petechial fever, in general, arose. From which he gathers, that the nature of buboes and petechial fever were either one and the same disease, or differed very slightly.† Rothman, in his history of the plague of Stockholm in 1710, says no one doubts the existence of plague, merely from the absence of buboes, carbuncles, blotches, &c.‡ In Joseph Brown's treatise on the plague, are mentioned the special signs of persons infected with the plague, according to Ludovicus Gordinius and Eberhardus Gorkelius, which are no other than such as are common to all malignant fevers: no mention is made of buboes or carbuncles, till we arrive at the succeeding chapter, "*the signs of death.*" In the great plague of London, it is said, "the practitioners in physic stood amazed, to meet with so many various symptoms, which they found among the patients: one week, the general distempers are blotches and buboes; the next week, as clean skined as may be; but death spares neither: one week full of spots and tokens; and perhaps the succeeding bill none at all."§

In the plague of Messina, in Sicily, in 1743, the physicians sent to examine the sick, reported, that the disorder was nothing more than the epidemic which had prevailed since February. This opinion they grounded on the fact,

* Obs. on the Increase and Decrease of Different Diseases, and particularly of the Plague. Lond. 1801.

† Parum tamen differentem.

‡ Duri autem revera pestem sine bubone, carbonato, macula, &c. non est quod quis dubitat.

§ Extract of a Letter from John Tillison, September 14, 1665, to Dr. Sancroft; preserved in the British Museum, no. 3785; quoted by Heberden.

that the disease was not contagious, nor communicable from one person to another. From this circumstance they concluded it could not be the plague, whose essential character, they said, was to be highly contagious. Physicians, surgeons, confessors and barbers, generally escaped it, though they attended the sick in the hospitals. The distemper, however, continued to increase with so much violence and mortality, that on the 4th of June, it was allowed by all parties to be the *true plague*. Known by this terrific appelation, the disease was afterwards deemed contagious.

Professor Thomas Fasano, published a book at Naples, on the epidemic fever which desolated that city in 1764.—It is entitled *Della Febre Epidemica Sofferta in Napoli l Anno* 1764, *Libra* iii. *Di Tomasso Fasano.* "He is so wholly convinced of the local and domestic origin, that he does not even mention any thing about a ship." And this in a seaport, says Dr. Mitchill, is a very remarkable circumstance. With much good sense, Fasano lays it down as a principle, that an epidemic is a slight plague, and that a plague is a powerful and furious epidemic. And in like manner, Michael Sarcone, who wrote a history, in two volumes, of the distemper which prevailed at Naples, in 1764, under the title of *Istoria Ragiomata di Mali osservati in Napoli nell' intero corso dell' Anno* 1764, does not pretend that this epidemic was any thing else than a pestilence, consequent upon the extreme scarcity and famine of the preceding year.*

The pestilence which prevailed in the French army at Jaffa is judiciously ascribed by Assalani, to the circumstances of their situation. The water of the Nile, and the want of ditches to drain the ground, occasioned several ponds or marshes, which could only be carried off by evaporation.—The French army on its arrival at Jaffa, encamped close to one of these ponds, the water of which supplied their wants, till their departure for Acre. On the taking of Jaffa, by assault, the number of Turks killed and half buried; the bodies of those which the sea threw back, and left on the shores; the miasmata arising from the putrefaction of the horses and camels, left dead upon the ground, or dragged scarcely beyond the walls; the want of fresh provisions; the filthiness of the inhabitants, the hordes of Bedouin Arabs who blockaded the city, formed a combination of circumstances, from which the army in a few days was overwhelm-

* See the introduction to Assalini on the Plague, by the American Publishers.

ed with all the horrors of war, famine and pestilence.*— Assalani himself, prefers calling this disease by the name of the epidemic fever.

The plague, spotted fever, scurvy, and other malignant diseases which prevailed in London in the 16th century, seem to have originated from causes similar to those above mentioned; and from the nature of the diet of the inhabitants, which consisted principally of animal food, and the filthiness of the streets and houses. Erasmus, in a letter to Franciscus, Cardinal Wolsey's physician, ascribes the sweating sickness, a species of plague, from which the English were scarcely ever free, in a great measure, to the incommodious form and bad exposure of their houses, and to the sluttishness within doors. The cabins were constructed of mud and clay, and served as common sinks for all kinds of filth; such as the matter rejected by vomiting, the urine of men and dogs, soup and dish water thrown upon the floor, the cleanings of fish and other sordes too shocking to mention.† In 1389, the streets of London were so abused by the dung and garbage of the common lay stalls, to the great annoyance of the citizens, that a proclamation was made throughout the city by authority of parliament, "that no person whatever presume to lay any dung, guts, garbage, offals, or any other ordure, in any street, ditch, river, &c. upon penalty of twenty pounds, to be recovered by any information in chancery." When the plague prevailed in London in 1569, orders were issued "to warn all inhabitants, against their houses, to keep chanels clean from filth, by only turning yt asyde, that the water may have passage." From these circumstances, we are not surprised that the city was overrun with epidemical diseases; which according to the season, and the strength of the remote causes, assumed different appearances. It is said by Burnet, in his history of the reformation, that in the last year of Queen Mary's reign, "intermitting fevers were so universal and contagious, that they raged like a plague." We are informed by Morton, that remittent fevers were very destructive for several years before the great plague of 1665. In 1658, Oliver Cromwell died of this fever; and he says that the death of his own father was also occasioned by this disease, which likewise affected his whole family. He proceeds to say, that the cold weather afterwards check-

* Assalani on the disease called the Plague, Amer. Edit. p. 8 & 9.

† Fœtens sputu, vomitus, mictum canum et hominum, projectam cerevisiam, et pisceum reliquas, aliasque sordes non nominandos.

ed this disorder; yet the seeds of it were by no means destroyed, and continued to show themselves under different forms. He observes, that during the winter, intermittents, quartans, tertians and quotidians, arose from a milder degree of the same poison, and were almost equally epidemic, as the continued or remittents were in autumn. And that the same fever under the continued type, more especially in the character of a simple and legitimate quotidian or tertian, was very common; and in autumn he observed it to be more or less epidemic, till the year 1664. He informs us, likewise, that in the two years immediately succeeding the great plague, dysenteries were very frequent, and we are afterwards told that the same disease returned every autumn, attended nearly by the same mortality. Maj. Grant, whose observations on the British mortality were published in 1662, says, "the diseases, besides the plague, which make years unhealthful in this city, are, spotted fever, small pox, dysentery, called by some the *plague in the guts;* and the unhealthful season is autumn. At the approach of winter the plague subsided; and the morbific causes operated in a milder way by producing agues, and other diseases of a less aggravated character than those of autumn. We are informed by Sydenham, that from 1661 to 1664, agues were epidemical in London, and again from 1677 to 1685. From the same author we also learn that dysentery was epidemical four years together; and the bills of mortality show the sum of deaths under the title of *bloody flux and griping in the guts*, in some years to have exceeded 4,000; and for five and twenty years successively, from 1667 to 1692, the number each year amounts to above 2,000.

The principal circumstance worthy of notice in the above account, is the striking connexion existing between what was called the plague and intermitting fever; from which we learn that the endemic fever, upon becoming milder and less malignant, assumed the intermitting type, more especially upon the approach of cool weather, and in certain years, when the causes were not sufficiently powerful to produce the more aggravated forms of disease.

Such was the want of delicacy and improvement among the Europeans, at the time here alluded to, and such their ignorance of the operation and effects of natural causes, that the neglect of cleanliness was not considered either as a physical or moral evil: and we accordingly find that the same causes of disease prevailed in almost every town and village throughout the kingdom. From a similar neglect of cleanliness, and from accumulation of filth, the same dis-

eases likewise prevailed at Oxford. To the preceding circumstances is to be attributed the scurvy which was frequently epidemic in England. Hodges, in his account of the plague in 1665, says, that "a scorbutic affection was very epidemic amongst them." And Hurtzner, in his travels at the time of Queen Elizabeth, remarks that "the English are often molested by the scurvy." Willis, who wrote a particular treatise upon this subject, describes it as an endemic in many parts of England, and almost every where sporadic. And Charlton represents the scurvy as an endemic disease.

One great cause of the diseases of London, it was observed, was the narrowness of the streets; in which filth of every description was permitted to accumulate: and the great fire, which, at the time, was considered a calamity, was doubtless an occurrence of national prosperity and happiness, and an event of providential goodness. The inhabitants, emerging from their supineness, ignorance and filth, profited by the experience of the past: the streets of the rising city were made straight and spacious: cleanliness was enforced; and as a reward for their sufferings, plague, dysentery, scurvy, &c. rapidly declined; so that, in a few years, the pestilence which had so long spread wretchedness and desolation through the streets of London, was known only by name.

From those authors who have given a circumstantial account of the plague, as it prevailed in other parts of Europe, it appears that the same causes every where contributed to its production. These causes are principally to be found in the political calamities of the country, and in the manners and habits of society. In illustration of this point, see the account of the plague of Denmark in 1690, by Thomas Bartholine; that of Cologne and Paris in 1570, by Forestus; that of Toulouse and Marseilles, by Diemerbroeck: and the *Traite de la Peste.* The progress of civilization in the nations of Europe, their improvement in the comforts of domestic life, their cultivation of the arts of peace and agricultural economy, and the light of science, have changed the physical aspect of the nation, and instead of noxious marshes, polluted kennels, offensive streets, and dirty houses, and their baleful progeny of diseases, cheerfulness and beauty smile upon the face of nature, and health follows as the reward of industry, cleanliness and virtue.*

* The words *industry, cleanliness and virtue,* are used in a relative, not an absolute sense.

Considering the baseness of its origin and the stigma of its parentage, it is not surprising that none will acknowledge the plague as an offspring of their own country; like an excommunicated and wretched outcast, it has, accordingly, found no quarter. Villani, who spent some time and labor in investigating the origin of a great plague in the fourteenth century, was at-last referred to China, and was told that it was there occasioned by the bursting of a huge ball of fire attended with uncommon stench.

A pleasing and salutary effect of the improvement of philosophy and medical science, may be observed in the health and happiness of a civilized country, where no irremediable causes of diseases exist. The discreet and intelligent physician detects the seeds and principles of disease in the lurking places of their generation, directs the remedy, and destroys the viper before maturity and the fostering hand of ignorance have furnished him with the fangs and venom of destruction. But what shall we say of those, who, in quest of a delusive phantom, turn their eyes from the light of truth and nature, and fix them on inanity? Such are those who denying the domestic origin of yellow and endemic fevers, by whatever name they may be called, search for the fancied germ in a bag of cotton from the south, or in a pair of old breeches from Constantinople, or finally in the offensive hold of such a vessel as Dr. Chisholm's ship Hankey. Unhappily for themselves and their disciples, under the error of ignorance, the delusion of prejudice, or the pride of dogmatical opinion, they fix their view upon an imaginary evil, and overlook the danger which surrounds them.

Let us once more direct our observation to those unhappy countries, where ignorance and superstition lend their aid to the destructive operation of physical evils. Are these evils, in all climates and situations, inevitable, or do they consist in many instances, in obvious and remediable circumstances? So obvious, that those who have the use of sight and smell cannot mistake the demonstration of their senses. Yet some there are, who like the skeptic philosophers of old, reject the evidence of palpable objects as mere seemings, and what is imperceptible and imaginary they consider real.

It is observed that the plague seldom or never breaks out in Constantinople in the houses of the opulent, or in such as are kept clean; and it prevails principally, and at all times, in the lodgings of the lower orders, which are generally kept in a state of excessive filthiness; the narrow, confined streets are in no better order, and are generally strewed with the remains of animal and vegetable substances.

The superstition, carelessness and ignorance of the Egyptians, serve to increase the physical evils of their country; which may be gathered from the present more frequent visitations of the plague than formerly. Savary asserts, that two hundred persons in Grand Cairo occupy less space than thirty in Paris. The streets are so narrow and full of people, that they jostle against each other, and sometimes a man is obliged to wait some minutes before he can make his way. Yet this same author, says Mr. Webster, alleges the plague not to be a native of Egypt. Baron Larrey considers the plague as an endemic, not only of the coast of Syria, but also of the towns of Alexandria, Damietta, Rosetta, and of the other parts of Lower Egypt; and remarks that the truth of this opinion will appear evident on taking into consideration the structure of their cities, the streets of which are narrow, crooked and unpaved, the houses badly constructed, and most of them filled with rubbish; besides this, each causeway forms a dam, in which the rain water collects and stagnates: this is more particularly the case in the maritime towns and in Damietta, on account of the surface of the earth being beneath the level of the sea. In addition to all this, are the surrounding lakes, and the swampy and noxious rice fields; the prevalence of the warm and moist south winds, which continue till the end of May: to which may be added, the want of cleanliness among the inhabitants, their bad diet and inactive life, the putrefaction of multitudes of dead dogs and other animals left in the causeways; the number of badly constructed cemeteries in the vicinity of the cities, in which the Turks leave an opening to the east, to communicate with the corpses thus giving vent to the gas which is formed, and increasing the impurity of the air. Our author further informs us, that at Alexandria, also, where the plague prevailed the first year with great mortality, many men and inferior animals were killed, their corpses were left lying on the ground, or were half buried beneath the ramparts, and contributed to the production of this disease. "At El Arych," says Baron Larrey, "we lost 79 by the plague, of a garrison of 300; many animals which had been killed during the siege and were already putrefying, were buried near the fort with too little precaution.—At Gaza the Mamelukes, in many parts of the town, left a great number of horses which died of an epidemic that preceded the plague; which according to the account given of it by the inhabitants, made dreadful havoc among themselves, as well as among the Mamalukes. I have observed

that the plague rages with more violence during the prevalence of the south winds, than when they blow from the north or north west, in which case it diminishes, and rarely appears if the cold winds continue for a long time."* Our author informs us, that the same appearances were observed upon dissection in the plague as in the yellow fever.—The liver was found larger than natural; the gall bladder full of black bile. The truth of the matter appears to be, that the yellow fever and the plague of Egypt are the same disease. Or in other words, they are the common endemic fever of the country, and very similar to that of the United States.

An account of a pestilential fever is recorded by Sir John Elliot, which originated in Naples in the summer of 1764, in consequence of the famine occasioned by a large exportation of corn. It is stated that 200,000, out of 2,000,000 of inhabitants that the kingdom contained, perished by the disease. The inhabitants of Naples, we are informed, are extremely remiss in regard to cleanliness, both within and without their habitations, which, together with the heat of the climate, and want of food, our author thinks is sufficient to account for the calamity. In July, the disease became highly infectious, was attended with petechiæ, swellings of the parotid glands, obstinate delirium, violent vomiting and fluxes of blood. It was observed that the sick who were removed into the hospitals which stood near the sea, recovered much quicker than in other places; and that few of them died there. In those well ventilated hospitals, open to the sea air, the progress of the contagion was entirely stopped, and none of the nurses or attendants on the sick were infected with the distemper.†

It has been commonly observed in the prevalence of epidemic diseases, that the poor are the greatest sufferers, in consequence of their filthiness, close and crowded habitations, and the numerous inconveniences and privations which they suffer.

Orosius, in his account of the pestilence which prevailed in Rome, B. C. 461, observes, that though many of the patricians were victims, it was more especially fatal to the

* Lar. Mem. Amer. Edit. Vol. I. p. 189.

† Lind on the Diseases incidental to Europeans in Hot Climates, p. 199 et seq. In the treatment of this disease, vegetable acids were given in large quantities. Ice water and bark, we are told, were the great remedies. Musk was likewise found extremely useful in relieving the head-ache. Mineral acids, where livid blotches and other high symptoms of putrefaction appeared, were administered with the best effect.

poor. It is also stated by Livy, in relation to the same disease, that many persons of rank and affluence perished, but that among the poor and indigent its ravages were extensive. According to Diemerbroeck, it was the practice in Italy and France to expel the poor immediately from the towns upon the appearance of the plague. The plague which prevailed at Marseilles in 1720, appeared first in the west part of the town, inhabited by the poorest people.* At Aleppo, it always begins in the Kusarias and Judida; the former are small huts, with few or no windows, which stand crowded together, and are inhabited by the lowest Arabs; the latter are the dwellings of the inferior Jews, "whose houses are small; or if large, the different apartments are crowded with different families; many of them are more than a story below the level of the street, in a condition half ruinous, dirty in the extreme, damp, and badly aired; and the wretched inhabitants are clothed with rags.† In Holstein, in 1764, it first appeared at Rensburg, among the prisoners, who, on account of offences, were condemned to public labor.‡ At Moscow it broke out in a very large house, which was used in baking bread for the soldiers; three thousand persons of both sexes were employed in this occupation, of whom the poorer portion, comprehending about one third, inhabited the inferior part of the building.§ And the same author says that the plague which raged at Moscow was almost solely confined to the common people; and that amongst the nobles and richer merchants scarcely any were attacked. In London, the plague in 1626, and 1636, broke out at White Chapel, a part of the town which abounded with poor, and with slaughter houses. We are told by Hodges, that the plague which prevailed in London in 1665, was entirely confined to the poor, on which account it was called by some the *poor's plague*. It is related by Lord Clarendon, that when he and other people of condition, who had fled from the plague, returned to London, they scarcely missed one of their friends or acquaintances, the mortality having been confined almost entirely to the lowest orders of the people.

London was subject to the plague at different times from 1593 to 1666. The week ending the 5th of September,

* Timon on the Plague of Constantinople. Phil. Trans. Abr. Vol. VII.
† City Remembrancer.
‡ Russel on the Plague.
§ Waldschmidt de singularibus quibusdam Pestis Holst. Haller Disputat, Vol V.

1665, 6,988 persons died of this disease; of 97,306 deaths in 1665, 68,590 were of the plague. The whole number of deaths this year amounted to 96,306, of which 68,596 were of the plague.*

Previous to the great fire in London, the streets were so narrow, and the stories of the buildings projected over each other so much, that the houses of the opposite sides of the streets nearly touched; so as in a great measure to exclude the light of day, rendering the air damp, stagnant and confined, and giving to the city the gloom and appearance of a vast dungeon.

The plague which, for many years, afflicted the Romans, was entirely of domestic origin. The marshes and low grounds, in the vicinity of the city, as described by Tacitus and Livy, were no doubt the principal cause of this disorder. If to this be added the poverty of the common people, their crowded habitations, and frequent scarcity of provision, we need be at no loss to account for its production. At the time here alluded to, the Romans were ignorant of commerce, nor did they own a single ship till more than two centuries afterwards.

It has been contended by some, that the plague which raged at Athens, at the time of the Peloponnesian war, was an imported disease. Upon inquiry, however, we shall find that such a presumption is not authorized by historical facts; since every cause which has been known to contribute to the production of pestilence in other situations, existed, in a remarkable degree, at Athens. The city was crowded with people, who took refuge from the war. So that from a population of 50,000, the number was augmented to more than 400,000 inhabitants. Of such a multitude, a great portion were without houses to lodge in, and were crowded together in booths and temporary hovels. From the destruction of the harvest in the country, famine prevailed in the city, which added to the crowded state and confinement of the people, the accumulation of filth, want of habitual exercise, and an inclement season, soon spread pestilence and destruction through the city.

The plague which prevailed in Rome B. C. 461, appears to have originated from similar causes. Livy represents the disease as being grievous and powerful, both in the country and city, and equally severe upon man and beast. The disorder was aggravated in the city by the vast influx of peo-

* Hebberden's Obs. on the increase and decrease of different Diseases, and particularly of the Plague.

ple, flocks and herds, who fled for refuge from the enemy. The filth of such an assemblage of various animals, suffocated the citizens with a stench to which they were unaccustomed, whilst the populace from the country, crowded in narrow hovels, were still more distressed by heat and want of rest.*

SECTION 2.

Inquiry into the Doctrine of Contagion, Importation and Exotic Origin of the Yellow Fever.

The instances of simple fevers arising from contagion are so few, that the contagious nature of any of them can scarcely be considered as existing; much less should it be an occasion of alarm or apprehension either to those whose duty and profession require their personal intercourse with the diseased, or to friends who may visit them, or to nurses whose duty demands a constant attendance. In the course of several years experience in the fevers of hot countries, I never had reason to suspect a single case to have arisen from contagion. What proof, indeed, can be brought in support of the propagation of disease by contagion, when all are equally subject to the influence of a common cause? But if the limited extent of the endemic allows the patients to be removed to a wholesome air, and if in this situation the disease is not communicated either to nurses or others, there is then but little ground for considering it contagious. To this purpose we are informed by Dr. Rush that in the fever of 1793 many people who were infected in the city were attacked by the disease in the country, but they did not propagate it even to persons who slept in the same room with them.†

The death of the adventurous and enterprising Dr. Valli, has, by some, been attributed to contagion. In the ardor of his pursuit and experimental researches, and bidding defiance to contagion, he had the boldness, and a *petit maitre* might say the indelicacy, to smell a dirty shirt in which a person had died of the yellow fever, and to rub it over different parts of his naked body, as also to apply different parts of his own body in contact with the corpse; as he was soon after seized with the fatal malady, there is some

* Tit. Liv. lib. iii. c. 6.
† Inq. and Obs. Vol. III. p. 154.

argument for supposing that his disorder was occasioned by his presumptuous imprudence above mentioned. The communication on the subject by Dr. Frost was published in the Medical Repository and in the journals of the time; and from the eminent character of Dr. Valli, his death became the subject of general conversation. Dr. Valli had extended his inquiries into Turkey, Syria, &c. in places the most infected with the plague; and from the circumstance of his visiting in Havana the most unhealthy and filthy parts of the city, and exposing himself to every source of infection, the probability is, that the efficient cause of his death was received from the atmosphere, in the course of his perambulations, inquiries and exposure. An instance is also related by Dr. Rush, of the yellow fever's having been communicated to a young man in Philadelphia, in consequence of opening a trunk of clothes, which had been the property of a Mr. Bingham who died of the disease in the West Indies, and of another person's taking the disease from the smell of a foul bed: but in neither of these cases was the fever communicated to the family, friends or attendants of the persons thus infected.* I beg leave, however, to differ from the Doctor, when he says that "the matter which produced the fever in both these cases, had nothing specific in it;" and that "it acted in the same manner that the exhalation from any other putrid matters would have done in a highly concentrated state." Though opposed to the doctrine of the specific nature of contagion, as understood and inculcated by some physicians of eminence in our own country; yet, we know that it is the property of some malignant diseases to secrete a morbific matter from the body which is capable of producing disease of the same character in another person. This is exemplified in the small pox; in which it appears that the matter which escapes from the lungs and skin in the form of vapor, or adheres to the clothing, is of the same nature as that which hardens into a concrete consistence on the surface of the body; and we are therefore led to conclude that wherever disease is taken from communication with the sick, or from articles that have been in contact with them, the matter producing the disorder must be imbued with the particular qualities of the complaint in which it was originally formed and evolved. Nor is it presumable that other matters, on as small a scale, in a state of putrefaction, equally, or even more offensive,

* Inq. and Obs. Vol. III. p. 94–5.

would have produced the same effect as the clothes above mentioned.

The reader will perceive that the above cases of infection from foul clothing are admitted as facts: but, notwithstanding similar instances are related by a variety of authors, there can be no doubt that alarm, ignorance, and superstition operating upon weak, ignorant, or prejudiced minds, have greatly enlarged the number of such occurrences beyond the bounds of truth and probability. And I feel authorized to remark, that in all my intercourse with the sick, and in my familiarity with malignant diseases, I have never met with an instance which could be attributed to the smell of an infected handkerchief, of a pair of gloves, or of old shoes, or finally to foul linen, clothing or furniture of any description.

Assalini, who, as surgeon, accompanied the French army to Egypt, and who had there an opportunity of gaining correct information on the subject of the endemic malignant fevers of the country, makes the following observations on this subject. "It has often been said, that in breaking open a letter, or in opening a bale of cotton, containing the germ of the plague, men have been struck down and killed by the pestilential vapor. I have never," he continues, "been able to meet with a single eye witness of this fact, notwithstanding the inquiries I have made in the lazarettos of Marseilles, of Toulon, of Guise, Spezzia, Leghorn, Malta, and the Levant. All agree in repeating that they have heard of such an occurrence, but that they have never seen it happen. Among those whom I have interrogated about this fact, I may name citizen Martin, captain of the lazaretto of Marseilles, who for thirty years past has held that situation: this brave and respectable man told me (says Assalini) that during that time he had seen opened and emptied some millions of bales of cotton, silks, furs and other goods coming from several places where the plague raged, without ever having seen a single accident of the kind."*

"Can any person," says Dr. Moseley, "for a moment reflecting, believe that the great plague in London in 1665, which imagination traces from the Levant to Holland, and from Holland to England, was caused by the opening of a bag of cotton in the city, or in Long Acre; or a package of hemp in St. Giles' parish. Is it possible to suppose that people should have been found to propagate or believe the well known and favorite stories of the advocates for Mead's

* Assalini on the Epidemic Fever in Egypt, Amer. Edit. p. 1 & 2.

theories. That a lady was killed immediately by smelling at a Turkey handkerchief, and a gentleman by only walking over a Turkey carpet."*

During the last visitation of the plague in London, every town within twenty miles of that city was more or less infected; and most of the principal towns in England, besides some parts of Ireland. Yet Oxford, which was previously drained and cleared, escaped, though the court removed thither, and no precautions were used to prevent the introduction of contagion from London. Dr. Platt, very reasonably imputes this exemption to the draining and greater cleanliness of that city.†

Hodges remained exempt from disease, notwithstanding his constant attendance upon the sick in the plague of London in 1665. Rhazes frequently practised in the plagues which were prevalent in his time, and lived, notwithstanding, to the protracted age of 120 years. Kaye practised with safety in the sweating sickness of 1551; and we are are informed by Procopius, that in the destructive plague which appeared in Constantinople in 1543, and which continued for two or three years, producing an almost depopulation of the city, no physician, nurse or attendant on the sick took the disease. Yet during the prevalence of the plague at Marseilles, most of the Capuchins, the Jesuits, the Dominicans, and various other denominations of monks and friars, who lived secluded in their convents, and avoided all exposure and communication with the sick, took the disease and died.‡

Prince Ypsilanda, Hopodar of Wallachia, in a letter to Dr. Carro of Vienna, dated Bucharest, July 25th, 1804, on the subject of the plague, observes: "The Imans exercise acts of charity with the most religious fervor. One may observe some of them, after having washed, wiped and buried thousands of pestiferous persons, without experiencing the least accident, seized with it, and die at the time when they were least exposed to the contagion."

We are informed by Col. Wilson, who was attached to the British army in Egypt, that the English and Turkish armies which marched to Cairo, passed through a country where the plague filled almost every village: they communicated, without any precaution, in the most intimate manner with the natives; established their ovens at Menouf,

* Moseley's Medical Tracts, p. 242.

† Hebberden on the Increase and Decrease of certain Diseases, p. 30.

‡ Journal de la Contagion a Marseilles.

where the plague raged violently: the Turks even rifled the diseased in the pest-houses at Ramanich, and at Cairo dug up the corpses recently buried, and yet no individual instance occurred of the malady in the armies.

Dr. Russel, in his account of the plague of Aleppo, gives a relation of twelve families, in easy circumstances, infected by the plague, and who did not communicate the disease, though they were nursed with the greatest care, and without the least precaution, as to personal safety, on the part of the attendants.

From facts which may be relied upon with the greatest confidence, there appears, therefore, to be but little reason for apprehending the contagion of the plague, admitting the existence of such a specific disease. Even the advocates of its contagious nature say that contact is absolutely necessary to its propagation; and here the opinion rests upon erroneous notions of the animal economy, and is contradicted by the discoveries of physiological researches.

Assalini, in his treatise on the epidemic fever of Egypt, the symptoms of which were buboes, partial gangrenes, or carbuncles, prostration of strength, stupor, head-ache and delirium; a disease generally called the plague, and which carried off the patient on the third or fifth day; in treating of this disease, he makes the following observations on the subject of contagion. "I have seen several individuals contract the disease and die, although they had been long shut up, according to the manner of the Franks. I should have thought it right to conclude that the disease of which we are now speaking was contagious, had I seen the Egyptians and Syrians fall under its influence as well as our soldiers, with whom they have constant intercourse. Citizen Larrey, besides the operations practised in this disease, opened several of the dead bodies, and examined with great attention all the parts, particularly the buboes, and the state of the lymphetic glands, all of which were, in general, found more or less enlarged. Citizen Desgenettes pointed out to me two punctures which he had made on himself, while in Syria, with a lancet dipt in the pus of a bubo: he made the inoculation, persuaded that the disease was not contagious,*

* This representation, it would appear, is not quite correct. Desgenettes says, that to support the wavering courage of the army, he, in presence of the sick, slightly scratched himself in the groin and armpit, but immediately washed himself with soap and water. Dr. M'Gregor informs us that Dr. White fell a sacrifice to the inoculation of himself with pestilential virus. (*Duncan's Annals of Medicine, Vol. VIII. p.* 264.) And the surgeon Matthias Deggio, mentioned by Dr. Guthrie, in his letter to Dr. Duncan, took

and both these learned and zealous staff officers have continued to enjoy good health. The commander in chief, Bonaparte, great in every emergency, braved, on several occasions, the danger of contagion. I have seen him in the hospitals at Jaffa, inspecting the wounds and talking familiarly with the soldiers attacked by the epidemic and buboes; a conduct which produced the best effect, not only on the spirits of the sick, but on the whole army. Among our operations in these cases, bleeding required, more than all others, our close approach to the patient and his bed. For my part, I followed the common method, without taking any precaution, except that of avoiding the patients' breath. In opening the bubo of an officer, the pus and corrupted blood spirted out on the back of my hand. I have slept in sheets, which without my knowledge had been washed by a female patient, who died the day after: she was the daughter of the consul of Ramli. A young German, the wife of one of our soldiers, came to consult me at the hospital; during my absence she laid herself on my bed for a quarter of an hour: I went to visit her the following day, and found her expiring.* It is remarked by the same author, that the Bedouin Arabs wandering in the deserts, are never attacked by the plague, notwithstanding their communication with the infected cities, during the times of the most dreadful plagues.†

To the enlightened intrepidity of such intelligent physicians may be opposed the ignorance and timidity of the ancients, and the error and prejudice of many of the moderns. Dr. Falconer, in his essay on the plague, p. 59, cautions attendants on patients laboring under this disease against coming in contact with the sick; and when it becomes absolutely necessary he advises them to protect themselves by wearing gloves of oiled silk or linen. He further directs, that the spoon with which the patient is fed should not be

this disease in a mild form by inoculation. I was informed by good authority that Dr Valli performed this operation on himself, and lost one of his great toes in consequence of the successful experiment. From analogy we should be led to conclude that where similar tumors to those in the plague make their appearance and proceed to suppuration in the yellow fever, disease might be communicated in the same manner. As will hereafter be made to appear, however, we have reason to believe that no absorption ever takes place from the sound, entire and unabraded surface of the body; and it is only when the venereal matter itself, applied to the most delicate parts of the body, excites irritation, that it is absorbed and produces disease. In contact with the common integuments, the venereal, as well as the pestilential virus, would remain perfectly harmless.

* Assalini on the Plague, or Epidemic Fever of Egypt, Amer. Edit. p. 17.

† Ibid, p. 65.

dipped in a larger portion of food than what is administered at a time; and that what he leaves should be thrown away. That in case of death, precautions must be used with respect to interments; that the body should be rolled up in the under sheet of the bed, and the oiled linen covering under it. "This would protect the assistant," says he, "from the immediate contact of the infected."

Many physicians of the last century were of opinion that intermittents were produced by contagion: among these were Boerhaave, Van Swieten, Baglivi, Cleghorn and Fordyce; and if, as already stated, the intermitting is but an inferior grade of bilious fever, it must be governed by the same laws, both in its origin and mode of communication; if the latter is contagious, the former must be also, but being a less malignant form of disease the morbid poison will possess less activity and virulence.

How many instances are there not in the recollection of every person conversant with bilious or yellow fever, in which the disease has been produced without any communication with persons labouring under the disorder? And on the contrary, how many are there, in which nurses, friends and physicians, whose duty obliged them to be frequently in contact with the sick, and yet, notwithstanding this familiar intercourse, have remained uninfected?

So rarely, indeed, has the yellow fever been propagated by contagion, that most of those who have been conversant with the disease, deny its ever being communicated in this manner.

Dr. Robert Jackson, speaking of the cause and nature of endemic fever in the West Indies, as originating from a vegito-animal source of materials, in contradistinction to that arising from an animal source, or an altered condition of the living human body, which he considers contagious, remarks that this cause "often rapidly destroys life; but it begets no process in the human system, by which it propagates itself. In short, endemic fever may be, and often is, epidemic; but it is not contagious, the individual requiring, in all cases, to be approached to the original source, before infection. As the sources of endemic fever are common to the surface of the globe, had the diseases arising from these sources been capable of multiplying causes, endued with the quality of producing similar diseases, the world must soon have become an hospital or a desert."*

* Outline of the History and Cure of Fever, p. 108.

"I have had no occasion to observe," says Dr. Hunter, "that the remittent fever, whether with its usual or more uncommon symptoms, with the yellow colour of the eyes and skin, or without them, was ever found to be infectious." He says the inhabitants have no fear of the fever being infectious, nor did he ever find reason for supposing it to be so either in private families or in military hospitals. And judiciously observes that the operation of a cause generally diffused, is often confounded with the effects of infection.*

Dr. Ramsay, in his History of South Carolina, observes, that the laws of Carolina, guard against the yellow fever, as an imported contagious disease; but, that the uniform experience of the physicians in Charleston, since the year 1732, proves that it is neither the one nor the other; "for in no instance (he remarks,) has a physician, nurse, or other attendant on a person, labouring under this disease, caught it from them. Several after taking it in Charleston, carried it with them, and died in the country; yet it never spread, nor was communicated to any one who attended them."— In a letter to Dr. Miller, dated, Nov. 18, 1800, on the same subject, he observes, "the disputes about the yellow fever, which have originated in the northern states, have never existed in Charleston. There is but one opinion among the physicians and inhabitants; and that is, that the disease was neither imported nor contagious. This was the unanimous sentiment of the Medical Society, who, in pursuance of it, gave their opinion to the government last summer, that the rigid enforcement of the quarantine laws, was by no means necessary on account of the yellow fever."†

It is stated on the authority of Dr. Mease,‡ that whilst he resided at the lazaretto, as inspector of sickly vessels, between May, 1794, and the same month in 1798, the clothing contained in the chests and trunks of all the seamen and others, belonging to Philadelphia, who had died of the yellow fever in the West Indies, or on their passage home, and the linen of all the persons who had been sent from the city to the lazaretto with that disease, amounting in all to more than one hundred, were opened, exposed to the air, and washed by the family of the steward of the hospital, and yet no one of them contracted the least indisposition from them.

Dr. M'Lean, in his Inquiry into the Nature and Causes of the Great Mortality, in St. Domingo, pages 78 and 79, ob-

* Observations on the Dis. of the Army in Jamaica, p. 178–9.
† Med. Repos. Vo. 4, p. 218.
‡ Rush's Inq. and Obs. Vo. 4, p. 241.

serves that the medical gentlemen could not have possibly escaped, if there had been any infection: nor could we remark, in any instance, that the immediate attendants of the sick suffered more than others. Dr. Wright, Dr. Gordon, and Dr. Scott, he says, agreed with him, in its not being contagious; "in short," continued he, "I never conversed with any medical gentleman in St. Domingo, who did not form the same judgment."

Dr. Wade has published a paper on the disorders of seamen and soldiers in Bengal, in the Medical Commentaries, wherein he observes, that during his residence in Bengal, fevers and dysenteries were often epidemical, but that they never exhibited any appearance to his faculties, which could excite a suspicion of contagion.*

Dr. Henderson published a treatise on the prevention of yellow fever, of 114 pages; from which it appears that all the observations he could make on the causes and progress of yellow fever militate against the opinion of its being contagious.

Mr. Thomas Clarke, in his observations on the Nature and Cure of Fevers, and of the diseases of the East and West Indies, &c. p. 110, remarks, that fevers in all climates, depend very much upon the state of the surrounding atmosphere, and that they are not at all contagious; or at least, that they are communicated in a very different manner from the small pox or measles.

It is stated by Dr. Catlett, that in the yellow fever which originated on board the Ganges, while in the West Indies, he discovered no instance of personal contagion.†

Dr. Hillary, on the yellow fever of the West Indies, says, "this fever is rarely or never infectious or contagious to others; I never could observe any instance, where I could say that any person was infected by it, neither have I ever seen two people sick in this fever, in the same house, at or near the same time, unless they were brought into the same house, when they had the fever upon them."‡

Palloni, on the yellow fever of Leghorn, observes that among so many priests as daily attended on the sick, there was but a single one attacked and destroyed by the disease; not one of the assistants in the hospital experienced its effects; and only two or three professors of the healing art, who were surrounded by the sick almost constantly for a

* Medical Commentaries, Vo. 16, p. 200.
† Med. Repos. Vo. 4, p. 244.
‡ Hillary, on the Air and Diseases of Barbadoes, p. 146.

great length of time, inhaled the infection; "with the exception of two or three streets in Leghorn," says Palloni, "where the disease seemed to have fixed its seat, few other parts were attacked by it for a moment, and not even then if they were more than the smallest distance removed, although a great number of persons, and vast quantities of merchandize were moved from the points where the disease raged, and daily transported and dispersed into the neighbouring country. To this there were few exceptions, and in those cases, the disease ended in the very houses where it broke out." This, for an advocate of contagion and importation, like Palloni, is saying a great deal. In a letter from a gentleman in Leghorn, dated December 22d, 1824, are the following observations upon the same subject.—"There was something mysterious in the nature of this fever—for though we have no doubt of its being imported, yet we observed in the hospitals, where the sick were conveyed, not a single person, out of one hundred who attended them in different capacities, was infected—nor did any of the men, amounting to between three and four hundred, who carried the dead to their graves, take the disease. It raged from the 15th of August to the 20th of October; during which time, there died about seven hundred persons."

Dr. Chisholm, as well as some physicians of our own country, have laboured hard to convince their obstinate brethren of the healing art and mankind generally, in opposition to their sober reason, that the yellow fever of Philadelphia, of 1793–4–5 and 97 was imported into the United States, from the island of Granada: to which it is said to have been previously introduced from Boulam, whereas it appears from the journal of Thomas Story, and from John Gaugh's History of the Friends, that the yellow fever prevailed in Philadelphia as early as 1699; from Hewitt's History of South Carolina, we also learn that many persons were destroyed by it in Charleston the same year; according to the same author, it appeared a second time in the same city, in 1703, and again in 1728, 1739, 1740, 1748 and 1761.

The yellow fever was epidemic in Albany in 1748; in Virginia, in the years 1737 and 1741. A similar disease attacked the Indians in Nantucket, in the summer of 1763; of which, out of 258 who were attacked, 36 only recovered. The same disorder prevailed in Philadelphia, in 1778, during the summer and autumn succeeding the evacuation of

the city by the British. This fever prevailed in New-York, in 1791, and in numerous other places, at a date anterior to the pretended importation from Granada. Dr. Chisholm, in his letter to Dr. Haygarth, has laboured this subject with his usual zeal; but his arguments are far fetched; and his conclusions erroneous. Since, however, it has been a matter of much discussion, it will be proper to give it a transient examination, in order to see whether the doctrine of importation is supported by facts and probability. "I am convinced," says Dr. Chisholm, "and most of the West Indian and North American physicians are also, that the same virus which gave birth to the malignant pestilential fever of Granada, was also the parent of that of Philadelphia of 1793, by means of the trading vessels constantly passing between these places. Dr. Pinkard says "when Europeans first take up their residence in the West Indies, it is usual for them, sooner or later after their arrival, to undergo an attack of fever, which in times of peace and tranquillity, when, as they are called, the *new comers* are but few, is termed a seasoning fever; but in times of war, when, from great multitudes arriving at the same period, its destructive effects are more striking, it is baptized with the terrific name of *yellow fever;* but whether denominated *seasoning*, *Bulam* or *Siam*, or marked by any other appellation, it is only the common bilious fever of hot climates; and it appears under an intermittent, a remittent, or a continued form, according to the soil and situation of the place; or the habit of body, and other circumstances of the persons attacked." "This," says Dr. Chisholm, who makes use of this quotation, "is precisely and truly applicable to the yellow remittent fever; but in relation to the malignant pestilential fever of 1793–94–95 and 96, it is absolutely irrelevant and untrue—The result of a very attentive consideration of the ship Hankey, as they are (*it is*) represented to me," continues our author, "on the arrival of the ship at Granada, I have already stated to be, that a fever, proceeding originally, perhaps, from the inclemency of the season, and the circumstances of the situation of the adventurers, had become, by confinement, filth, consequent impurity of the air, and depression of spirits, a true *jail fever*, or a fever of infection, heightened to an almost pestilential virulence." In page 95 he adds, "in this ship, (the Hankey,) are to be found the remote causes of this dreadful fever which devastated the West India islands, the British Army and Navy, the principal cities and

towns of North America, and some of the more populous sea-ports and towns of Spain and Europe."*

Such is the sweeping asseveration of Dr. Chisholm; as remote from truth and probability, as we are from the antipodes. It is to the infection generated on board this vessel, the Hankey, that, according to Dr. Chisholm, and the other physicians of the West Indies, and the United States, of whom he speaks, we are to trace the bilious or yellow fever, which has committed such ravages among the human race in the West Indies, North America, and in the different towns and sea-ports in Europe; whereas, it appears from what was above stated, page 36, that this disease had prevailed in the United States, at different places, long before the time of Dr. Chisholm, and his ship Hankey; and, Dr. Hillary, as well as other West India writers, have described the same disease as existing in the West Indies, many years anterior to the time alluded to by Dr. Chisholm. Can it indeed, be reasonably supposed, that a little stinking vessel, like Pandora's box, should scatter the seeds of pestilence and death throughout the earth? Or, was the jail fever, as Dr. Chisholm represents this disease to be, which was generated on board the Hankey, ever known to become epidemical? Never: but even admitting the possibility, the jail fever, is the jail fever in every part of the world; and to suppose it capable of being extensively diffused in the character of an epidemic, presupposes the possibility and danger, that every case of typhus which originates in a filthy hovel, may form the germ of a pestilential disorder.

Dr. Chisholm, with the dictatorial arrogance of superior sagacity, has implicitly asserted, that the bilious yellow fever, which prevailed in Philadelphia, in 1793–4–5 and 6, and which is so well and accurately described by Dr. Rush, was in fact the *jail fever*, generated on board the vessel above mentioned, and from her propagated and diffused over the surface of the globe. And are the physicians of the United States such novices in their profession, as not to be able to distinguish the jail, from the bilious fever? Need they the instructions of Dr. Chisholm, to form their opinions and direct their judgment? If men will permit themselves to be guided by the leading strings of infancy, they must expect to be fed with the pap of childhood.

From the concurring circumstances, we are not surprised that typhus fever should have been generated on board the Hankey. The same thing would have happened in the

* Chisholm on the Malig. Pestilent. Fev. p. 93.

West Indies, under the same circumstances, and has happened in a thousand instances in other places; yet, who would have the weakness and credulity to trace a prevailing epidemic to the offensive colluvies of a ship? We are told by Dr. Chisholm, that this was no doubt a *ship fever*, as it was generated on board the Hankey, at the time she lay at Bulam, from the crowded state of the vessel, want of cleanliness, heat of climate and a rainy season. And that it was not generated on shore, he informs us that Bulam, being surrounded by the sea, enjoys all the advantages of the sea breeze; and being dry, and not incommoded by any marshy tracts, it is considered as the healthiest spot on the windward coast, and that it is not inhabited.* In page 86 of the same letter, he mentions the circumstances of the vessel itself as favouring the production of this *jail* or *ship fever*, "having upwards of two hundred people," says he, "of whom, women and children constituted a part, thus confined in a sultry, moist atmosphere, cleanliness could not well be attended to, however well inclined the people themselves might be. And no doubt can be entertained, that neglecting to sweeten the ship, to ventilate her afterwards, and to destroy the clothes, bedding, &c. of those who died on board, was the sole cause of her retaining the seeds of infection when she arrived in port." In page 114, he describes the particular features of distinction between this disease and the *typhus icterodes*, as he is pleased to style the yellow fever. "A principal distinction," says he, "between this disease and the typhus icterodes, is the yellow suffusion, which in the former very seldom happens, in the latter almost always." "On the other hand," he adds, "the appearance which marked the character of the fever most unequivocally, was a species of efflorescence, which is said to be peculiar to malignant and pestilential fevers; this efflorescence resembles more patches of red and livid spots, than what is generally understood by the word petechiæ, and appeared sometimes at the commencement of the low or comatose state; but, often a few hours before death, it was a very fatal symptom. The neck, shoulders and breast, were generally the parts of the body the eruption broke out on; but, in a few very violent cases, almost the whole body has become a deep livid or black colour, three hours before death.

* See Chisholm's letter to Haygarth, "in order to correct the pernicious doctrine promulgated by Dr. Edward Miller, and other American Physicians, relative to Pestilential Fever." Lond. 1809, p. 84.

It is strange that such avowed defenders of the specific nature of fevers, as Dr. Chisholm and his associates in opinion are, should, in the present instance before us, recede so far from their principle, as to acknowledge the identity of diseases, which, according to their own doctrine, differ so essentially in their nature and symptoms. I have seen a disease, similar to the one described by Dr. Chisholm, as prevailing on board the Hankey, generated on board the United States brig Louisiana, at Plaquemine;* but as different from the bilious remittent fever of Philadelphia, in its symptoms, as is the small pox from the measles. And the fever which prevailed in Philadelphia, in 1793, is too well described by Dr. Rush, to admit of being confounded with the *jail* or *ship* fever of the Hankey. It appears that none of the men, who were sent on board this vessel, received the infection; nor did fever appear in any of the ships of war, which lent her assistance, in consequence of this communication. This subject is taken up by Dr. Trotter,† who considers it probable from these facts, that the Hankey did not import the infection that produced the Granada fever, "for after the disease was worn out," says he, "she had a passage to make to the West Indies, of many hundred leagues. It is also doubtful how the effects left in the Hankey could produce the fever, for the bedding was thrown away, and what clothing remained, had been aired, and probably, had scarcely been in contact with the body after being sick. Mr. Smithers, surgeon, who went on board the Hankey, while on her passage to the West Indies, was examined before the Governor of Granada on the subject, and gave his opinion, decidedly, that the Hankey did not communicate this fever to the colony; from our people remaining some days on board, at sea, and escaping with impunity, is a strong support to the evidence of Mr. Smithers. Dr. Chisholm has laboured his arguments to prove, that it was a new disease; though perhaps, only the common endemic of the country, more aggravated by a greater number of Europeans being the subjects of its influence, than he had been accustomed to observe before." It even appears that Dr. Chisholm has given an exaggerated account of the endemic of Granada. Lieut. Governor Young, in his *Return of the Bulama Adventurers*, speaks of the fever as being of the *intermittent kind*, and *not infectious*,

* See account of this Disease, in *Observations on the Topography and Diseases of Louisiana.*

† Medecina Nautica, Vo. 1, p. 331.

while the mortality is ascribed by Mr. Paiba, to various causes, some having intermittents, some more violent fevers, some diarrhœa, others dysentery, and others again fell martyrs to the indiscreet use of opium, and spirits, which they took as preservatives.*

It appears, moreover, that the ship Hankey did not arrive at St. George, in the island of Granada, till the 19th of March, whereas we are informed by Mr. Paiba, that the fever prevailed in Granada, as early as the 1st of the same month, and Dr. Chisholm himself observes, that "from the beginning of March, to the first of May, 200 out of 500 sailors, who manned the ships in the regular trade, died of this fever." The sickness and mortality which prevailed in the town of St. George, in the Island of Granada, is abundantly account for, by a reference to local causes, without bringing in the aid of importation.

The town where Dr. Chisholm's malignant pestilential fever raged, in 1793, is situated on a narrow strip of land, bounded on the one side by the bay of the same name, and on the other by the Careenage. The Careenage is a long inlet or arm of the sea, running up on the south and east side of the town of St. George. It is low, little moved by winds, and nearly stagnant, as the river never rises or falls there, more than four, five, or six inches. The shore of the Careenage, on the town side, is remarkably low, narrow, and crowded by numerous little buildings, chiefly of wood, which are separated only by lanes, situated on, or near the wharves, and inhabited by the lowest of the people, ill-accommodated, and devoted to intoxication and every species of debauchery. At the head, or east end of the Careenage, is a large marsh; which, at all times, but especially at low water, sends forth the most noisome and offensive smell.—Into this inlet, vessels are general brought to refit and careen, and indeed for protection, as they are perfectly safe from the winds. At the time of the Hankey's arrival, it appears to have been unusually crowded with shipping; and that ship was brought round from the Bay, into the Careenage, very soon after she reached Granada.† Now, if in addition to all this, we take into consideration the geographical position of this island, in the 12th° North latitude, under a vertical sun beaming upon a mass of corruptible materials, we can be at no loss, as to the origin of a disease of unusual malignancy, or to account for the mortality which took place

*Edinb. Med. and Surg. Journal, Vo. 8, p. 341.
†Med. Repos. Vo. 1, p. 459 and seq.

among Europeans lately arrived. We further learn, that in different places, the disease assumed different aspects of severity or mildness, according as particular parts of the island were more or less marshy and low, or elevated and dry. Notwithstanding all his endeavours to trace a foreign derivation, Dr. Chisholm describes a similar fever which prevailed in the Island of Granada, in 1791, and which he acknowledges to have been of local origin.* But because the ship Hankey had been upon the coast of Africa, in 1793, where she had engendered disease, and subsequently arrived at the island of Granada, a place more unhealthy from local causes and situation, than Bulam itself, he vainly endeavours to trace the fever to a foreign origin; though the Hankey, previously to her arrival at Granada, was thoroughly purified, and had for many weeks been free from infection and disease. We are informed by Dr. Le Blond, in his Essay on the Yellow Fever, that as long ago as 1770, the Careenage was a sickly place. The yellow fever was frequent, and particularly fatal to strangers. Its malignity was dreadful, in consequence of the unhealthy exhalations from the marsh, near the port and town of St. George. Dr. Le Blond, practised there two years. There were, then, local causes enough for the disease, and the importation from Bulam had not been thought of.

For misrepresentation of facts by Dr. Chisholm, respecting the origin and propagation of the yellow fever in the island of St. Thomas, I refer the reader to the statement of Mr. Eckard, Danish Vice Consul, in the Medical Repository, second Hexade, volume 1, page 336.

Dr. Chisholm, with much gravity and form, endeavours to point out the distinction, between the plague and *malignant pestilential yellow fever*, and thinks that he has settled the difference in the following manner. "First, the difference between the plague and *malignant pestilential fever*, appears chiefly in the mode of communicating the contagion, in the plague, Dr. McGregor thus states it "but except from actual contact, there never appeared to be any danger." It is, therefore, and the fact is further confirmed by some observations of Dr. Russel, pretty evident, that contact is necessary to produce the disease. In the *malignant pestilential fever*, around the diseased person, there is an infectious atmosphere of a determinate radius, within which the disease may be communicated: in it contact is

*Edinb. Med. Comment for 1793.

not a necessary condition: Secondly, a second distinction is perceived in the atmospheric temperature necessary to give prevalence to each disease respectively. This is a very curious circumstance, and certainly, in many respects, a very important one; the contagion of plague can be prevalent, only in a temperature between 40° and 80°, a temperature above or below these degrees extinguishes it; the contagion of the malignant pestilential fever becomes prevalent only in a temperature between 70 and 90 degrees; but it is extinguished or suspended in a higher, and probably cannot exist in a much lower.*

This distinction, which the Doctor endeavours to establish, if rightly understood, is no distinction at all. In the first place, as to contact being necessary to produce the one and not the other; it is proper to understand, that a general disease is never communicated by primary action on the surface of the body; as it will be hereafter shown, that no cuticular absorption ever takes place, and without such absorption, we are unable to account for the production of disease in this manner; since the cuticle is destitute of nerves and blood vessels, and therefore insensible to impressions calculated to affect the vascular and nervous systems. As to the second distinction, that plague can only be prevalent at a temperature between 40° and 80°, is allowing almost all possible variation from the heat of summer to the cold of winter; and as plague, if it prevails at all, must appear in one of the seasons embraced between the ranges of this temperature, it is no more or less than saying, that this disease must become prevalent in one or other of the four divisions and seasons of the year; the truth of which was sufficiently known, before the profound discovery of Dr. Chisholm.

As Dr. Chisholm does not stand so high as to give his assertions the weight and implicit evidence of oracles, he should have adduced authority to show that a temperature above 80 degrees of Fahrenheit, extinguishes the plague, or that a degree of heat above 90, puts a stop to the *malignant pestilential fever*, if by this denomination he designates the bilious yellow fever of the United States; if so, his position is untenable, for this disease has prevailed in various places, where the temperature in the sun was as high as 115 of Fahrenheit. He was however tolerably safe in limiting the degree to 90, as the natural temperature of the atmosphere, in the shade, seldom exceeds, or even reaches that,

* Chisholm's Letter to Haygarth, p. 155-6 and 7.

in the hottest latitudes. It is well known that a high temperature is necessary to the origin of all fevers of an endemic character, and no less so in the plague than in fevers of inferior malignancy. It is not, however, at the same time denied that diseases of a very malignant character, and such as have received the name of plague, have prevailed during the winter season, and under a low temperature of the air: but, as the term *plague* has been extremely vague and indefinite in its application, there is no doubt that diseases of a very different character have been baptised with this appellation, as a generic term, for all malignant disorders with which physicians were unacquainted. Thus, the term *cold plague*, *winter fever*, *spotted fever*, *pneumonia typhoides*, &c. have all been given by different persons to the winter epidemic of the United States, which, however, differs very materially in its causes, from the endemic bilious yellow fever or the plague of hot climates, arising from heat, moisture and putrefaction.

Dr. Chisholm wishes to establish the peculiar and specific character, of what he calls the *malignant pestilential fever*, which he says originated on board the Hankey, and was a *true jail fever*, afterwards propagated into various parts of Europe and America. Had not this opinion been embraced by some respectable gentlemen of the profession, in our own country, as well as in Europe, I should have considered it too weak and unsubstantial to deserve a moment's consideration; but, as the removal of error, is no less important, than the advancement of truth, I have bestowed the more pains on this subject, than its merits might intrinsically seem to require.

In the distinction attempted to be established, by Dr. Chisholm, we are informed that the yellow fever is not contagious, and that the *malignant pestilential fever is contagious;* and, although he had never been an eye witness of the fever of any of our seaports, and with very little experience in the West Indies, he has the confidence to assert, that the fever which prevailed in Philadelphia, in 1793, and in subsequent years, as also in different parts of the United States, was the *malignant pestilential fever*, and not the yellow fever, as represented by Dr. Rush, Dr. Miller and others. But, to follow Dr. Chisholm, any further in his speculations, would be, to forsake the substance, in pursuit of a shadow.

Dr. Pinkard, who practised in the West Indies, where he had frequent opportunities of observing the endemic fever of the climate, after affirming the identity of the disease, known by the distinctive appellations of yellow fever, sea-

soning, Bulam, &c. and ascribing their diversity of aspect to the soil, situation and circumstances of the person attacked, he continues, "in negroes and creoles it is frequently an ague, in those who are in a degree acclimated a remittent, and in new comers a continued fever; preserving in each case a distinct type throughout its course, while in other instances of its attack upon Europeans it shifts its form and runs its progress with the most uncertain irregularity; in proof of which I may remark, that I have received newly arrived soldiers into the hospital, at one and the same time, with the seasoning malady, under all the varieties of an intermittent, remittent and continued fever, and although each had been differently attacked, all of them have died in the course of only a few days, with every symptom of the most malignant yellow fever." On the subject of contagion, he observes "of all the multitudes of black men and women, whom I have had occasion to see employed constantly in the hospital, and who have exercised all the menial duties about the sick, the dying and the dead, I never yet knew a single instance of any one of them, either male or female, taking the disease."

In a letter from Dr. Senter of Newport, dated January 7th, 1794, is the following fact, in support of the principle that the yellow fever does not spread by contagion, or propagate itself by imported fomites. "This place," (Newport, R. I.) says the Doctor, "has traded formerly, very much to the West India islands, and more or less of our people have died there every season, when the disease prevails in those parts; clothes of these unfortunate people have been repeatedly brought home to their friends, without any accident happening to them."

If such is the difficulty attending the propagation of yellow fever, it may be asked, wherein consist the use and necessity of quarantines?* Not as a means of preventing the importation of the plague or yellow fever, which, as epidemics, never can originate from contagion; but the sole utility of this practice, founded as it is upon erroneous principles, consists in making captains and masters of vessels attentive to the cleanliness of their crews and of the vessels under their command: the fevers which often commit such destruction on ship-board are of local origin; quarantine regulations are founded on the presumption that they are exotics and of foreign growth. The captain of the infected

*See the Questions proposed by the Government of the Duchy of Oldenburg.

vessel knows to the reverse, and as by care and cleanliness he has it in his power to prevent this inbred pestilence; the expense and delay attending the quarantine of an infected vessel, might have an influence in making him attentive to the health of his crew. It is conceived, that this is the only benefit attending the practice of quarantine. But it is still a matter of doubt, whether this consideration would operate more powerfully in the preservation of cleanliness, than that of private interest, safety and advantage, independent of all laws and quarantine regulations. Against the practice of quarantine, several objections may be urged; and one of the most considerable and weighty is, that by directing the attention of the police of cities and sea-ports from domestic nuisances to the importation of a foreign foe, cleanliness and the means of self preservation are neglected at home; and thus the disease, arrayed in all its terrors, arises in ambush, from the fostering indulgence of ignorance, blindness and neglect.

The evidence in proof of importation is, at best, equivocal. All that can be advanced in its support is, that previous to, or during the prevalence of the yellow fever at a particular city, a vessel or person arrived from an infected port; whereas, had the same vessel or person arrived at any other time no notice would have been taken of the circumstance. As such arrivals, however, in large sea-ports, take place every week, there is less difficulty in tracing the importation, than in accounting, upon the principles of the contagionists, for the general exemption from disease. But, in support of the position that the yellow or endemic fever of hot climates arises from local causes the proofs are numerous and conclusive; and when principles are established by facts and philosophy, speculation and error should yield their pretensions.

Dr. Ffirth, speaking of the fever of Batavia, says, "the disease is certainly local, being engendered by the causes already mentioned, (see page 63.) and is never contagious. The people here, have no idea of the fever being spread or communicated by contagion; yet, if the fever was to prevail in the sea-ports of the United States, it would be called *malignant fever*, and said to be very contagious. It shows many of the symptoms of the yellow fever of America, and perhaps the only reason they are not exactly alike, is, the difference of climate, &c. for it is equally, yea, more malignant in many cases. In Batavia, every person says it is *not contagious;* in America, a disease nearly similar, if not the same, is said, by many, to be decidedly contagious,

and imported. If it is not contagious in Batavia, can it be so in America? If it arises from local causes in the one place, why not in the other? The laws of nature are immutable, they are alike in every situation. If the disease is not contagious, and arises from local causes in one country, or one part of the world, it must in every part in which it prevails; if certain circumstances will produce it in one place, they will in any place, in every place, no matter, whether in the torrid or the temperate zone."

Such are the opinions of those physicians who have been most conversant with the yellow or endemic fever of hot climates, in relation to the subject of the contagion and origin of this disease. Many more illustrations might be brought forward in relation to this branch of the inquiry, but it is considered that the foregoing are sufficient. In order to give them the more weight and authenticity, I have frequently stated the facts in the author's own words; a practice which the mere historian is not compelled to observe. Where the references were preserved, I have generally stated them, with a view of affording facility to the inquiries of others who may feel an interest in examining the subject matter of investigation.

OF THE

PREDISPOSING AND EXCITING CAUSES

OF

ENDEMIC FEVER.

CHAPTER III.

Whatever has a tendency to impair the usual strength and vigor of the body, may be considered as acting as the predisposing cause of fever; as fatigue, however induced, severe labor, excessive exercise, exposure to a high temperature, poverty of diet, strong passions, fear, grief, anxiety, disappointment, habitual or occasional melancholy, violent purges, suppressed evacuations, repelled eruptions. It is at the same time difficult to draw the line of distinction between what are commonly called the predisposing and the exciting causes; since it frequently happens that the same agent acts both as the predisposing and the exciting cause of fever. A more proper distinction will probably be found in considering miasma or infection as the predisposing, and all other sudden, violent and debilitating impressions as exciting causes. In this way we may presume that during the prevalence of endemic fever, persons exposed to the noxious miasmata are in a constant state of predisposition, from the circumstance of their being continually imbued with the febrile infection, which requires only the weak and unguarded state of the system, produced by any irregularity, excess or fatigue, to excite it into action. At other times the body may be so strongly impregnated with the materials of disease as to require no particular exciting cause, other than the infectious matters already present; the miasma or infection thus acting both as the predisposing and exciting cause.

In a state of predisposition, a slight cause is sufficient to destroy the balance of the system, and to turn the scale in

favor of disease. Thus a strong cathartic, a fit of intoxication, the sedative passions, fear, grief, despondency, depression, melancholy and despair—late watching—excessive venery—fatigue—a hearty meal—indigestible food—a free indulgence of viands, beef, pork, fish, fowl, &c.—cucumbers, muskmelons, unripe fruit—exposure to the night air—wet feet—wet clothes—the excessive use of cold bathing—too sparing a diet—inactivity of body, &c.

The circumstance of the body itself affording the strongest and most susceptible predisposition is a constitution unaccustomed to the climate; to which may be added a scorbutic habit. Upon some of these causes it will be proper to make a few remarks.

It has been universally observed that persons removing from a healthy, to a low, swampy and unhealthy country, are the first and greatest sufferers by the fever. This circumstance is annually exemplified in those who migrate from the northern to the southern states: and has been more abundantly demonstrated in the West Indies, where the greatest proportion of troops that are sent to that country die the first year with the endemic fever. To these islands disease is a stronger safeguard than all the fortifications that could be raised by the art of man. Where death has been anticipated in a single instance by the implements of war, thousands have fallen victims to the destroying pestilence.

Dr. Hunter, in his Observations on the Diseases of the Army in Jamaica, states, that of the negroes sent along with the troops against Fort St. James, scarcely any died, although few or none of the soldiers survived the expedition.* As a constitution unaccustomed to morbific miasmata is in a peculiar manner liable to be affected by exposure to unwholesome exhalations, so, on the other hand, a constitution inured by custom to their presence is one of the best securities against their injurious operation.—Hence persons coming from the West Indies, even to an unhealthy part of the United States, are, in a great measure, secure against any prevailing febrile epidemic. To this purpose we are informed by Dr. Rush, that in the year 1793 a body of emigrants from St. Domingo, amounting to upwards of three hundred in number, who had made their escape from that colony, under all the circumstances of the most afflicting depression, arrived in Philadelphia, at the time when the yellow fever raged with the utmost malig-

* Diseases of Jamaica, p. 25.

nancy; yet not one of them was attacked with the destructive malady which was then desolating that city. And the fact is rendered the more striking from the circumstance that the emigrants who arrived at the same period from Ireland, Germany and other parts of Europe, were attacked by the fever, even in greater proportion than the Americans themselves. The same thing has been observed in different parts of Alabama, during the prevalence of endemic fever in summer and autumn. Persons from the unhealthy parts of the Carolinas and Georgia are much less subject to the endemic fever than those from Tennessee, Kentucky and the northern states. Among emigrants from the latter places, the disease is more frequent and violent; often assuming the most aggravated symptoms of the yellow fever. Persons from northern cities and sea-ports are also less liable to fever than those from more healthy and inland situations. A long familiarity with and exposure to noxious agents constantly and uniformly acting, at length fortify and secure the constitution, in a great degree, against their injurious tendency. Thus persons who have passed a *seasoning* in the East or West Indies, are seldom afterwards attacked with the endemic of the climate. Not so, however, in the middle and southern states of North America. No country in the world is more healthy than the southern section of the United States during the winter season. It is from this exemption from the causes of disease during this period, that the constitution is again rendered susceptible to their operation on the approach of the ensuing season: the cold and healthfulness of winter imparting to the system, in a considerable degree, the sensibility of northern and European constitutions to morbid impressions. Thus it is that natives and old residents in the country not unfrequently suffer and die with the common endemic of the climate; though in a much less degree than strangers from the northern states, and the hilly and healthy parts of Tennessee and Kentucky.

It was observed by Dr. E. H. Smith, in the bilious or yellow fever of New-York in 1795, that few persons died who had regularly resided in a low, sunken part of the city, (formerly called the swamp,) but that to those whose evil destiny led them to seek a new dwelling place there, it proved highly pestilential.* We are further informed that in the same epidemic, the greater number of those who sickened and died of that disease were foreigners; persons either just

* See the letter of E. H. Smith, an ingenious physician of New-York, to Dr. W. Buel of Sheffield, Mass. in Webster's Collection of Papers on Bilious Fevers, p. 79.

arrived from other states, from the West Indies and from Europe, or who had not long been settled in the city; and that the probable proportion of citizens to strangers who died, did not exceed one to seven.*

Dr. Le Blond,† in his Observations on Yellow Fever, speaking of the exemption of native Africans from the disease, remarks, that the inhabitants of Whidah and Mandingo, after having been naturalized to an atmosphere, often heated to 120° and upwards, feel relief on being removed to the relatively cooler settlements in America. Hence they enjoy their full vigor in the most hot and sultry parts of the West Indies, and of the neighboring continent. Next to the Africans, the native Indians of South America are enabled to resist the invasion of yellow fever in a more remarkable degree than any other people. They are scarcely more susceptible of the malign influence of the maritime regions than the negroes. The English, Anglo-Americans and Dutch are observed to be the most violently invaded; the French next; the Spaniards, Portuguese and Italians suffer less than either of the former. The yellow fever, according to Dr. Le Blond, is engendered in the road where vessels ride at St. Pierre's, in Martinique, among the crews of their newly arrived ships rather than in the town. At Angustura, he saw a most malignant distemper arise from the corrupt quality of the bread which the men were obliged to feed upon. At St. Thomas, on the right bank of the Oronoko, there is a great unhealthiness during the summer. Putrid bilious fevers affect the inhabitants. And our author says, he has no doubt, if an European regiment should arrive there in the summer, that the yellow fever would break out, and destroy the greater part of them. At St. Lucia, in 1767, there was as destructive a yellow fever as ever was known on board the American vessels anchored in the road, while the inhabitants on shore were exempt from it. In one vessel not a soul survived; and new comers fell sick with alarming rapidity. At St. Vincents he was repeatedly told by the Creoles, that they never heard of the yellow fever until after the arrival of the English. At Cayenne, new comers from cold countries contract yellow fever, not by catching contagion from any sick person, but from the heat, gaseous impregnation, and other qualities of the atmosphere. These, while they inspire the natives with health and vigor,

* Webster's Collection of Papers on Bilious Fevers, p. 70.

‡ See the Med. Repos. Vol. X. p. 65, to which I am indebted on this, as on many other occasions.

exert a deadly malignity upon strangers: insomuch that they often die on the first or second day of the attack. They rarely survive the third, and more rarely still the fifth. The unhealthiness of French Guiana, to men from the colder climates, is evinced by the unfortunate expedition under General Degouges, in 1802. This officer arrived at Cayenne, with a body of three hundred men, in the midst of the greatest heats. The atmosphere had become loaded with exhalations from the drying and rotten marshes. In about a month the yellow fever appeared among the soldiers, and in a short time cut off two hundred of them, together with their general, the commandant of the place, and several other officers. And although these men were quartered in the same barracks with the old battalion and the regiment of blacks, not a single one received any contagious impression. Only a few hard drinkers among these old standers had putrid bilious remittents, which, however, differed from the yellow fever, only by their longer duration and milder symptoms. But the yellow fever, though it favored those who had previously been seasoned, was as fatal to the newly arrived passengers and sailors as it was to the soldiers.—And while the fresh emigrants were sorely afflicted, the people of the country experienced only the fevers and ordinary disorders attendant on calms which succeed the intense heats of summer.

The pernicious influence of miasmatic exhalations to foreigners and strangers, is strikingly exemplified in the various military expeditions that have been undertaken in tropical climates. To a destructive mortality occasioned by an unhealthy season operating upon constitutions unaccustomed to the climate, have justly been ascribed the failure of Admiral Vernon's expedition to Carthagena in 1741, and the unhappy fate of Hosier at Porto Bello in 1746. A similar fate attended the expedition of General Dalling to Spanish South America in 1780. Of 1800 persons who embarked upon this enterprise, 380 invalids only survived to return towards the end of the year. A similar mortality occurred among the Europeans who took Fort Roanoak, (a town at the bottom of the Bay of Honduras,) in 1779.

Dr. Blane, in his Observations on the Diseases of Seamen, remarks, that it sometimes happens, that a ship, with a long established crew, shall be very healthy; yet if strangers are introduced amongst them, who are also healthy, sickness will be immediately produced; and Dr. Rush confirms the observation of Dr. Blane from the experience of the revolutionary war. "The history of diseases," says Dr. Rush,

" furnishes many proofs of the truth of this assertion. It was remarked that while the American army at Cambridge, in the year 1775, consisted only of New-Englandmen, (whose habits and manners were the same,) there was scarcely any sickness among them. It was not till the troops of the eastern, middle, and southern states, met at York-Town and Ticonderoga, in the year 1776, that the typhus became universal, and spread such peculiar mortality in the armies of the United States."*

Young men from fifteen to five and twenty, especially those of a fleshy, sanguine and plethoric habit are more liable to fever than those more advanced in life. At the period of five and twenty, the constitution seems to have acquired its perfection of vigor and maturity, and is less affected by the changes of temperature and the seasons; the nervous and muscular systems become then less sensible to morbific agents, whilst at the same time they acquire more strength and steadiness of action. Persons of dry, spare, and withered habits; who look tough. hard, and sun-burnt, are much less subject to attacks of fever than the fair, plump, moist and florid. It has been thought that women and children are less subject to fever and other malignant disorders than men. If this, however, can be admitted as a general rule, there are many exceptions to it; and it is well known that in the state of Alabama, in 1823, the epidemic was peculiarly fatal and severe among small children. Dr. Rush likewise remarked in the yellow fever which prevailed in Philadelphia in 1793, that children were equally liable to be attacked as adults.†

A scorbutic habit of body may be considered as affording a predisposition to an attack of the prevailing epidemic in its most malignant form. It was observed by Dr. Huxham, that the scorbutic habit of body common to sailors increased the malignity of the small pox.‡ We are also informed by Baron Larrey, that some navy surgeons with scorbutic habits, on entering upon the duties of their office to which they

* Rush's Inq. & Obs. Vol. I. It has been remarked in Alabama, that stocks of healthy cattle, from Tennessee or Kentucky, upon mixing with those of Georgia and the Carolinas, also healthy, become immediately diseased and die off in great numbers. It has been said, in the way of half jest half earnest, that the Georgia and Carolina cattle always carry infection about them, but from being accustomed to it are not subject to disease, whereas those from Tennessee, being entirely free from distempers, catch the contagion and die.

† Rush's Inqu. & Obs. Vol. III.

‡ Huxham on Epidemics, Vol. I. p. 94.

were called, were seized almost immediately with the plague and died.*

It has likewise been remarked in the plague, that persons of a dry habit, infants with a fine skin and flaxen hair, young people of a sanguine temperament and irritable fibre, were more liable to the plague than those advanced in age.† The same observations apply to bilious fever.

Among the predisposing causes of fever should likewise be mentioned the use of animal food and spirituous liquors; as this subject, however, will be considered more fully under the head of *Prevention*, I would here just remark that, as elsewhere shown, both animal food and distilled spirits contribute essentially to produce a scorbutic habit of body, to give occasion to the generation of a morbid excess and quality of bile, and to produce that state of the system which may be considered as affording the strongest predisposition to fever. By disordering the function of the liver, they lay the foundation of permanent disease in that organ; a disease frequently fatal in our southern climate. This disorder and its causes were not unknown to Hippocrates, though wine was at that time the strongest drink with which mankind were acquainted.‡

While all the functions of the body are performed with regularity and strength, the system is less susceptible of morbid action, and less easily impressed by any noxious agent; but as soon as this equilibrium and harmony of movement are destroyed by any violently exciting or debilitating power, a predisposition to fever takes place, and the constitution is liable to be invaded by disease; and the noxious materials, which before lay dormant in the body, and might have been expelled, or prevented from exerting any injurious influence by the natural powers of the system, seize the unguarded moment, (if I may be allowed the expression,) and immediately exert their deleterious agency. Hence it happens that so many are seized immediately subsequent to a fit of intoxication; and hence it is that a healthy constitution, and regular and temperate habits, are the best preservatives against disease.

* Larrey's Memoirs, Vol I. p. 219.

† Assalini on the Epidemic Fever or Plague of Egypt, p. 29.

‡ "In the disease of the liver," says Hippocrates, "there is a pain in the region of this organ, the person loses his former complexion, and becomes of the color of a pomegranate. In the summer season the disease comes on suddenly; and is produced by the use of beef and drinking wine too freely. For at this season of the year these things are most hurtful to the liver, and give a great determination of bile to this organ." *Hippoc. De Intern. Affec. Oper. Om.* p. 549.

Cold, or the diminution of heat from a high to a considerably reduced temperature, may justly be considered as an exciting cause of fever. The effect is the same, whether applied through the medium of fog, dampness, cold water, or cold air. The night air, in low and marshy places, is peculiarly injurious to health. In a former work,* I took occasion to observe, that it frequently happened at Plaquemine, upon the Mississippi, that the men who were sent upon picquet guard at night returned in the morning affected with dysentery or fever. Their station was about half a mile from the fort, on the margin of a bayou, a place which was extremely low, wet and marshy. Upon my suggestion, a large barge was floated down the bayou and moored in the stream; on board of this, the men were more comfortably protected from the unwholesome damps and vapors of the night; whereby the evils consequent upon exposure, were, in a great degree, prevented. Cold being a sedative power, it follows that its effects will be more considerable on the body where the latter is in a state of debility, than when under the opposite circumstances of strength of fibre and activity of the circulation; for when the circulation is languid, the process of generating heat is less energetic, and the natural warmth of the body is diminished: under such circumstances, the body is incapable of adapting itself to sudden changes of temperature, and the application of cold operating with increased power deranges the functions of health.

There seem to be three reasons why the night air is peculiarly unhealthy. First, the coldness and dampness of the atmosphere, impeding and checking perspiration; secondly, the concentration of febrile miasmata, occasioned by this reduced temperature. We know that all fluid and aeriform substances are expanded and rarified by heat; and on the contrary, that they are concentrated and condensed by cold. If, then, marsh miasmata and morbific effluvia are aeriform substances. (and I presume no person will contend that they are not.) it follows, by a general law, that the more condensed they are in volume, and the greater their concentration, in the same proportion are they increased in activity and virulence. Whilst, on the other hand, they may be so rarified by heat as to lose their infectious quality and become perfectly innocent. This seems to be the reason, at least in part, why the blowing of the hot land wind puts a stop to the plague in Egypt. But it should be understood that the heat and effect of this wind cannot be imitated by the feeble

* Observations on the Topography and Diseases of Louisiana.

powers of ordinary combustion, no more than the faint glimmering of a candle can rival the mid-day effulgence of the sun. Such is the intensity of the heat which accompanies this wind, that, in the sensation it produces, it is described as coming from the mouth of a furnace. It is therefore in vain to attempt to put a stop to a prevailing epidemic by the kindling in the streets of artificial fires. Excessive heat operating upon the human body is found to act as the exciting cause of fever. Thus Dr. Rush observes that bakers, hatters and blacksmiths were more liable than others to be affected by fever. The experiment of kindling fires in the street was tried in London during the prevalence of the plague; and on the night which succeeded three days that the fires had been kept burning, the number of deaths amounted to 4,009, although during the three or four preceding weeks no more than twelve thousand had been destroyed. It is said by Dr. Hodges, that the practice of kindling fires was found hurtful in the plague of London. "Heaven wept," says he, "for the mistake of kindling them, and mercifully put them out with showers of rain." The same experiment was tried at Toulon, when a most fatal plague prevailed there in 1721, by kindling, at the sound of the bell, a fire in front of every house in the city; the plague, notwithstanding, continued to prevail with unabated violence, and in the course of ten months destroyed two thirds of the inhabitants. The same thing was had recourse to during the prevalence of the plague at Marseilles, and with no better success.

It has been observed in the preceding paragraph, that there are three reasons why the night air is peculiarly unhealthy: "First, the coldness and dampness of the atmosphere, impeding and checking perspiration; secondly, the concentration of febrile miasmata occasioned by this reduced temperature." Thirdly—the third manner in which night air proves peculiarly unhealthy, is the attraction which moisture has for miasmata. That dampness is favorable to the diffusion of marsh miasmata, appears from the circumstance that all natural odours are more perceptible in the damp air of the night, immediately after a shower of rain, or during the exhalation of the morning dew. Of this fact, few, probably, are ignorant, as it must be familiar to all who have entered a flower garden or a blooming orchard under the circumstances and at the time above mentioned. The smell of marshes and of all putrefying and putrescent bodies is always more sensible and offensive after night-fall.—Odours, which remain unnoticed during the day, become

very perceptible after sun-set. It is well known that the odour of a skunk, which in the day time is palpable only at the distance of a few rods, at night, under favorable circumstances, is perceptible at the distance of more than a mile.

It appears to be from the disposition of miasmata to attach themselves to humidity, that a shelter of any kind, by excluding, in some degree, the dampness, serves as a protection against disease; and it will be at the same time obvious that the drier the apartment and situation, in the same degree will they be found conducive to health.

One great intention of the sense of smell is to prevent our inhaling offensive effluvia. Thus nature points out to us the manner in which noxious miasmata prove injurious to the system. The circumstance of fever originating in this way, Dr. Currie thinks justifies a practice, which he has been informed is common among more experienced seamen, on the coast of Guinea and other warm climates, who, when exposed, during the night, to a breeze from the marshes, wrap their heads in a sea cloak, or other covering, and sleep fearless on the deck with the rest of their bodies exposed. The manner in which this may be explained is this; the moisture on the cloak attracts and arrests the miasmata, and prevents their entrance with the breath.

Though we do not contend that an atmosphere is unhealthy and infectious in proportion as it is offensive, for we know that the air of a particular place may be very offensive from the putrefaction of a dead animal, and yet no disease may be the result; and on the other hand, very virulent infectious miasms may exist in the atmosphere without being perceptible to the sense of smell. All this, however, does not prove that this aerial and infectious vapor is absolutely free from odour, any more than if it were contended that no water exists in the atmosphere because it is not perceptible to the sight. Our sense of smell is not remarkably acute; and the matter may be sufficiently virulent to produce disease, though it be too much attenuated to be obvious to the senses. And as the water in the atmosphere is rendered manifest when condensed into drops of rain or dew—so may infectious miasmata be concentrated and again rendered perceptible by such substances as possess an attraction for them. Such appears to be the case with most humid bodies, and particularly water, which in warm weather, and in unhealthy situations, by standing in a vessel soon contracts a disagreeable and offensive smell: and in this way infectious vapors being received into the

mouth and lungs by respiration, and attaching themselves to the moisture therein contained, may find admission into the mass of circulating fluids.

The disposition which noxious exhalations have to attach themselves to humid substances, is probably the reason why fogs in or near wet and marshy places are particularly unhealthy: the same circumstance will explain why exposure to the damp air of the night is more injurious than the dry air of the day; and it might be a question, if the air were entirely deprived of humidity, whether it would not thereby be purified from noxious miasmata, and rendered perfectly healthy. In support of this opinion, as already stated, we are informed, that the blowing of the hot land wind, puts a stop to the plague in Egypt. This fact seems to be proved from the circumstance of an opposite state of the atmosphere being found so injurious to the system, and so favorable to the propagation of disease. It has been observed in epidemics, as typhus, small pox, plague, &c. that their activity and virulence are increased by a stagnant, damp and foggy state of the atmosphere; and that they decrease when the weather is dry and moderately warm. It was remarked by Dr. Smith, that a contagious patient becomes greatly more so when his clothes are wet and his body heated by exercise, so as to be in a state of perspiration. In illustration of the same fact, it was observed by Volney, that in Egypt the winter increases (*fomente*) the plague, because it is mild and damp; and that the summer destroys it because it is hot and dry, ("*l'ete la detruit, parceque il est chaud et sec.*" It is remarked by Dr. Brocklesby, that he found nothing more productive of ague than soldiers lying on the damp ground in camp. Dr. Lind represents the employment of cutting wood and clearing the land of trees and bushes as extremely unhealthy; and gives instances in illustration of the circumstance. He likewise cautions against exposure to the night air in swampy and unhealthy countries, or where there are great night fogs. "The duty alone," says he, "of fetching fresh killed butchers' meat at night, for the use of our ships' companies in the East and West Indies, has destroyed every year several hundred seamen. In those parts of the world butchers' meat must be brought on board at night, immediately after it is killed, otherwise it will not be fit for use the next day. During the sickly season at Batavia, a boat belonging to the Medway, which attended on shore every night, was three times successively manned, not one having survived that service. They were all taken ill at night when on

shore; so that the officers were at length obliged to employ none, but the natives of the country on the business."* It is probably upon the principle of the attraction existing between water and miasmata, that vessels lying at a short distance from an unhealthy shore remain secure and exempt from disease; the miasms being absorbed by and blended with the water. Thus, we are informed by Dr. Rush, that many persons escaped the yellow fever of 1793 in Philadelphia, by remaining on board of vessels anchored in the middle of the Delaware. It is perhaps from this circumstance that the water carriers at Cairo, according to Mr. Volney, escape the plague. Does not the attraction which water possesses for infectious miasmata suggest the propriety of keeping vessels filled with this element in the rooms of febrile patients, removing it from time to time as it becomes charged with infection?

It has been observed that the first high grounds in the vicinity of noxious exhalations or the low grounds near to the source of such infectious vapors, are more unhealthy than the plains below. This circumstance may be accounted for upon the presumption that the infectious miasms attach themselves to the particles of moisture that are exhaled from the low grounds or marshes, and which are observed to be attracted by and to settle upon the neighboring mills. Points and eminences are objects of attraction both of electricity and vapors, and fogs before they are dissipated are observed to settle upon the higher eminences of the adjacent hills.

From the power of cold in concentrating infectious miasmata, we may also account for the frequent increase of malignant epidemics at the approach of cool weather. The fever of 1793 in Philadelphia, proved most fatal in the latter part of October. In this epidemic, we are told by Dr. Rush, that the night air, even in the warm month of September, was often so cold as to excite the disease, when the dress and bed-clothing were not adapted to it; and that every change in the weather, that was less than that which produced frost, evidently increased the number of sick people. This was obvious after the 18th and 19th of September, when the mercury fell to 44° and 45°. "The hopes of the city received a severe disappointment on this occasion, for I well recollect," says the Doctor, "there was a general expectation that the change in the weather would have

* Lind on the Diseases incidental to Europeans in Hot Climates, p. 152.

checked the disease." The same increase of the number of sick was observed to follow the cool weather which succeeded the 6th and 7th of October, on which days the mercury fell to 43° and 46°.*

It was observed by Sydenham, that the greatest mortality of the plague happened about the autumnal equinox; and the same author advances the position, that the effects of cold upon the human body, have exceeded the combined ravages of war, pestilence and famine.†

As to the influence of the protracted use of cold bathing in exciting both intermitting and remitting fevers, many instances have fallen under my own observation. During my residence in Louisiana, many of the soldiers were in the daily habit of swimming and bathing in the river; and in the indulgence of this amusement, frequently remained in the water above half an hour at a time; in consequence of which it not unusually happened, that three or four of the number would be reported sick on the ensuing day with fever and ague, frequently relapsing and running into the bilious remittent. This injurious practice was at length limited to once a week, after which the attacks were less frequent.

Captain Delano, speaking of the practice which his company were in, of bathing in the river at the island of Timor, says, "we paid dearly for the pleasure of fresh water bathing. We took it so frequently, and staid in the water so long, that we brought on intermittent fevers, and several of our officers died. All would have died, had we not left off this indulgence. Europeans must be always cautious how they bathe in fresh water in hot countries. The effects of it in Timor is not the first instance of the kind which I have known from personal observation."†

Low and damp places, by favoring the diffusion of miasmata, are more unhealthy than those that are high, dry and broken. For the same reason those who live on the ground floor are more obnoxious to fever than those who live in the upper stories of the same houses. Dr. Russel, during his residence at Aleppo, was in the practice of prescribing, from the second story to several hundred of pestilential patients, who assembled every morning beneath his window.

In many parts of our country we see people with sallow, sickly, and bloated countenances, inhabiting the vicinity of a low and marshy valley or reed brake, for the sake

* Med. Inq. & Obs. Vol. III. p. 91, 92.
† Sydenham's Works, p. 74.
‡ Delano's Voyages, Boston, 1817, p. 107.

of convenience to water, and who, by fixing their residence at a greater distance, instead of agues and dropsies, might enjoy health and longevity.

It is observed by Dr. Munro, that the more moist the season, the more subject an army is to agues. A damp air and foggy weather have always been found to be more favorable for the origin and spreading of malignant diseases, partly on account of the reason already assigned, as facilitating putrefaction, and favoring the diffusion of morbid poison, and partly by checking perspiration. Dr. Lind and Dr. Smith supposed that a damp air increased the strength of contagion, from the idea that humidity was more favorable to its diffusion through the atmosphere.

Assalini observed that the citadel of Cairo, on account of its elevated situation, preserved the inhabitants of this fort and its environs from the plague. "If the inhabitants of this fort," says he, "in spite of their daily intercourse with those of the city, were preserved from this disease, it must be because the damp and infected air, which had destroyed the health of the inhabitants of Lower Cairo had not sufficient elevation to reach the highest part of the citadel and its environs, and consequently could not impair the health of those who lived there."*

The presumption is, that infectious miasmata are mostly confined to the surface of the earth, and never rise to any considerable distance above it; or if they do, by being blended and diluted with the common atmosphere, they lose their virulence and infectious property.

The circumstances under which the application of cold to the body proves most prejudicial, are, on the part of the person, debility; and with respect to the cold itself, a sudden transition from a high to a reduced temperature, its protracted application to the body, together with a state of dampness. When applied to the surface of the body through the medium of wet clothing, its power and effects are more immediate and prejudicial than when applied to the inner superficies of the lungs, by respiration. As water is a denser medium than air, its application will convey a stronger sensation to the body than air of the same temperature; partly because it is a more rapid and better conductor of heat; but it is principally on account of the evaporation which takes place from the surface of the body when a person has become wet in a shower, that the sensation of cold is experienced. Water is here only the medium by which the cold acts upon the

* Assalini on the Epidemic of Egypt, p. 58.

body, and provided no evaporation took place, the sensation of cold would not be produced, nor would any evil consequences ensue.

Dr. Lind advises that in unhealthy climates and situations, as the East and West Indies, the crews of vessels be kept at work, upon deck, as little as the nature of the service will permit, before sun-rise and after sun-setting, and only when the sea breeze blows. This advice is founded upon the conclusion, that when the sun is above the horizon, the noxious land vapors are more dispersed; they are then much rarer than in the night, or even in the evenings and mornings when they become denser and more apt to infect, and when the atmosphere is more charged with miasmata in consequence of its greater humidity. Dr. Lind relates it as a matter of constant experience, that the greatest sufferers in unhealthy harbors are the boats' crews, and such as being employed in the necessary business of wooding and watering the ship, are obliged to sleep on shore, where they are exposed to the unwholesome land air: since in sleep their bodies are in a state of relaxation, and in the greatest danger of infection. We are further told by the above named author, that this circumstance is so well known at Rome, that scarce an inhabitant of comfortable circumstances would venture, during the summer and autumn, to sleep a night at *Ostia*, or in the neighborhood of the marshes adjoining the city. "A clergyman of long observation in such matters," says Dr. Lind, "assured me that few of the farmers, reputed early risers in his parish, which is near the level coast of Holderness, live to be old."*

It has been suggested by some, that the moon in its changes has an influence upon the constitution in disposing the body to be affected by intermittents. This opinion has been advanced and defended by Dr. Jackson, Dr. Lind, and Dr. Balfour; though the two latter, from subsequent experience, seem to have receded from their former belief. The ideal influence of the moon and stars upon the human body, is a relic of the old astrology, witchcraft and superstition, which governed and led the weak minded in the days of our Trans-Atlantic ancestors. The mind, as well as the body, was thought to be under the influence of the queen mistress of the night, and persons laboring under derangement were the supposed victims of her displeasure, and, in compliment to her divinity, styled *lunatics*. It would appear, however, that the only remote influence which the moon can have in the pro-

* Lind on the Diseases of Seamen, p. 73-4.

duction of disease, is by occasioning, at the change and full, a greater elevation of the tide, which upon receding leaves the marshy grounds, with the animal and vegetable matter, to undergo putrefaction. This effect will be most remarkable in warm climates, where the land is low and subject to inundation. As marsh miasmata, as well as contagion, are limited in the extent of their diffusion, a removal to a short distance from these infected places, will be sufficient to ensure safety and protection from such noxious exhalations.

Among the natives and old residents of warm and unhealthy climates, the miasmata, or semina of disease, frequently lie dormant and inactive in the body, producing little or no derangement of the health; the constitution, from long habit, being accustomed to those unwholesome exhalations, becomes, in a great degree, insensible to their operation.—They, however, frequently, in such persons, give occasion to an increased secretion of bile, which, after accumulating in considerable quantity, often effects its own expulsion, either by vomiting or stool; and, as observed by Dr. Clark,* we may frequently see the natives of warm climates vomiting and discharging great quantities of bile one hour, and the next hour riding into the country, quite relieved from every symptom of indisposition.

* Observations on the Diseases which prevail in Long Voyages to Hot Countries.

CHAPTER IV.

OPERATION OF THE REMOTE CAUSES.

Of the primary mode in which Infection or Miasma comes to operate upon the System in the production of Disease.

That marsh miasmata, and the exhalations from putrefying animal and vegetable matters, in any other situations, act as the essential causes of endemic fever, there are probably but few who have the skepticism to doubt.

There appear to be but three ways in which the primary operation and impression of febrile infection in producing disease can be explained.

1st, Either by referring this effect to its action on the surface of the body; or,

2dly, On the lungs through the medium of respiration; or,

3dly, On the stomach and bowels.

A secondary consideration is, whether its operation in the production of fever is upon the vascular or nervous system.

Darwin, Gardiner, Turner, Senac, Lind, Hunter and Balfour, were of opinion that the infection of fever is received into the stomach; and this seems to have been the prevailing opinion among those physicians who have expressed their sentiments upon the subject.

The opinion of Dr. Ferrier that infection may produce disease by direct impression on the olfactory nerves, is scarcely entitled to consideration.

Dr. Moseley seems to express a belief, that pestilential fevers are produced by a primary impression on the surface of the body.

Fernelius, Pugnet, Bell and Currie express their belief of the infection being received by the lungs in respiration.

Fracastorius seems doubtful whether contagion is not communicated by absorption from the surface of the body; but at the same time supposes that in the majority of cases it finds admission from the air in respiration.

With regard to the opinion of infection* being received into the stomach, it may be observed, that the inference is drawn from appearances not altogether satisfactory and conclusive, viz. the nausea and vomiting which frequently occur at the commencement of fever. But these symptoms are also common in other cases, wherein we know that no infection has been received in this manner, and consequently that this disorder of the primæ viæ may be satisfactorily accounted for from an affection of the general system. This is exemplified in the inoculated small pox. It is well known that the stomach is a very important organ, and much disposed to sympathize in affections of the whole or of particular parts of the system. It is upon the healthy condition of this viscus that the soundness of every part of the animal economy essential depends. Pain destroys the appetite, as do also distressing passions and affections of the mind. A dissection of a dog by Dr. Cooper, that died with hydrophobia, exhibited all the usual marks of inflammation and effusion which take place in common malignant fever. And the affections of the stomach in this disease are no less remarkable than in the yellow fever: such as nausea, a burning sensation in the stomach, vomiting and costiveness. So that this affection of the stomach can afford no proof of the morbific matter of fever, being primarily applied to it. But in relation to the manner in which infection is received, is it not improbable that a sufficient quantity of the febrile virus should have been absorbed by the saliva, to produce disease? It is well known that the symptoms of fever have been suddenly produced, in consequence of a few moments' exposure to virulent and concentrated febrile infection.—Lancissi, Lind, Pringle, &c. give instances of persons who were exposed to the exhalations of marshes, being suddenly affected with sickness, vomiting, delirium, and other symptoms of fever, which continued till the disease had run its usual course. In such instances the short period of expo-

* As I may frequently have occasion to make use of the words *infection* and *infectious*, it is proper to define the sense and acceptation in which I employ them, in order to draw the line of distinction between infection and contagion. For this purpose I would observe, that an impure atmosphere, whether occasioned by animal putrefaction, marsh miasmata, or other causes capable of producing disease in the person who breathes it, is infectious; and where disease is communicated from one sick person to another, either through the medium of the air or by contact, it is understood to be contagious, though in both instances the matter producing disease may, with the strictest propriety, be called infection. The first may be styled the infection from putrefaction, or infection from external causes; the other the infection from disease.

sure, and the sudden and violent commotion produced would seem to forbid the idea that the morbific virus had affected the sanguiferous system through the medium of the primæ viæ. Moreover, instances are recorded wherein persons have swallowed the infection of small pox and lues venerea with impunity.* Again; persons, from sleeping in unhealthy places on shore, have received the seeds of a fever, which did not ripen into disease till after the vessel had been ten or fifteen days at sea;† can we suppose that the semina of disease could have lain all this time in the primæ viæ without having sooner disordered the functions of health? Besides, we know that very offensive things have been taken into the stomach as articles of food, or otherwise, either with impunity, or else the offending substances have effected their own expulsion by vomiting, or by the production of diarrhœa, which ceased as soon as the offending matter was expelled. These miasmata are aeriform substances; and we know that carbonic acid gas, an aerial fluid, the most destructive to animal life when received into the lungs by respiration, is perfectly innocent and even salutary when taken into the stomach.

It is scarcely consistent with the present state of anatomical and physiological sciences to suppose that disease is communicated through the medium of the surface of the body. The cuticle is destitute of nerves and blood vessels,

* We are informed by Dr. Rush, that in Maryland, the negroes eat, with safety, the flesh of hogs that have been previously bitten by mad dogs; and that he has heard of the milk of a cow, at Charleston, in the same state, having been used, without any inconvenience, by a whole family, on the same day in which she was affected with this disease, and which killed her in a few hours. In confirmation of similar facts, he quotes the authority of Dr. Baumgarten, in the Medical Commentaries, who observes that the flesh and milk of rabid animals have been eaten with perfect impunity. *Rush's Inq. and Obs. Vol. II. p.* 326. No direct conclusions, however, can be drawn from these circumstances; and as to the venereal matter being swallowed, as related by Bell, Hunter and others, without producing any disorder, we should recollect that the stomach possesses the power of changing the quality of most substances taken into it—that the gastric juice or fluid is a powerful agent—and that as the stomachs of all animals not exclusively carnivorous, contain a greater or less quantity of acid, of course all alkaline substances will become neutralized; and whether alkaline or not, will be materially changed from their original qualities. But there is a point beyond which this corrective agency of the stomach ceases, and where the poison received abounds in excess, in consequence of the quantity being too great for the neutralizing or corrective power of the stomach, the same effect will be produced as if the infection had been immediately received into the mass of circulating fluids. This appears from the experiments of Fontana, which will be hereafter noticed.

† Badinach. Med. Obs. & Inq. Vol. VI. Blane on the Diseases of Seamen. Lind on Hot Climates.

and, therefore, seems to be incapable of sensation, or performing the function of absorption; and in order for the miasmata of disease to act upon the system, from application to the surface they must enter the pores of the cuticle by absorption. But physiological researches, as well as the phenomena of health and the symptoms of disease, seem to prove that transpiration, and not absorption, takes place from the surface of the body. Doctors Rosseau, Clapp and Dangerfield, have illustrated this subject in their experimental inquiries,* from which it appears that even spirits of turpentine, when applied to the body in the form of a bath, does not impregnate the urine with its odour, provided the person avoids the vapor, by breathing the external air through a tube; but that the impregnation becomes very pungent from breathing the vapor for a short time, though the spirits had not been applied to the surface. The same experiments were made with mercurial ointment and with a similar result, with this difference, that the person who applied the friction to the others protected his hand by a glove, but being exposed to the vapor through the medium of respiration, he became impregnated with the mercury, whilst the others to whom the mercurial ointment was applied, and who avoided the mercurial vapor, remained unaffected. Richerand, however, who stands high as a physiologist, is of opinion that absorption does take place by the skin, and founds his opinion on the following arguments.—"The increase of the weight of the body after walking in damp weather; the abundant secretion of urine after remaining some time in a bath; the evident swelling of the inguinal glands after long continued immersion of the feet in water, an experiment often made on himself by Mascagni; the effects of mercury administered by friction, &c.; incontestibly prove that absorption is effected by the skin, under different circumstances with more or less activity."† In support of the same opinion, it was found by Stuart that the color of the urine was increased by the immersion of the body for an hour or two in a bath tinctured by an infusion of madder, rhubarb, &c.‡ The instances brought forward by Richerand, however, are most of them explicable by referring them to the absorbing power of the lungs. A curious fact in support of cutaneous absorption is mentioned by

* See their Dissertations on Cutaneous Absorption in Caldwell's Collection of Medical Theses.

† Richerand's Physiology. On Absorption.

‡ See Experiments and Observations in defence of the doctrine of Cutaneous Absorption. By Josephus B. Stuart of Albany.

Dr. Simpson, of a youth who, laboring under a fever, was seized with a diarrhœa; whilst in a state of stupor, his whole body was burning with the fever, no drink could be administered, nor his mouth moistened; in this condition his feet were immersed in cold water, upon which the fluid in the vessel suddenly diminished in quantity, and the same water, scarcely colored, was immediately discharged per anum, as if from the operation of a cathartic.* If in certain instances absorption does take place from the surface, the presumption is, that this is not effected in any considerable degree under ordinary circumstances, to which the garments that invest the body would form a considerable obstruction.

The modern experiments of chemists would seem to prove that absorption by the lungs is not required in order that the necessary changes may be effected on the blood by the action of the atmospheric air; that the change of the blood, from venous to arterial, is effected in the lungs, principally by the loss of its carbon which is given out, and combining with the oxygen received by inspiration, forms carbonic acid gas, which is thrown off with the aqueous vapor and the unconsumed nitrogen. If absorption can take place from the surface of the body, we may reasonably suppose that this process is effected with more facility by the lungs, where the membrane interposed between the blood vessels and absorbents and the air received in respiration is much more delicate and thin than the cuticle. And although oxygen itself may not be absorbed, this does not forbid the supposition that other aerial substances may find admission. Lymphatic and absorbent vessels we know are plentifully distributed through every part of the animal frame, and we should suppose that in such an organ as the lungs, the absorbing power would be nearly as great upon their contents as those of stomach and bowels are upon the chymous fluid. In support of this opinion it may be remarked, that Fontana found, whilst he was under the operation of a brisk purgative, that his weight was increased several ounces during a walk in the evening for an hour or two, when the atmosphere was moist. A case still more striking is related by Dr. Watson. A boy who had been sweated and starved down to a certain weight, in order to fit him as a rider in a horse race, acquired an additional weight of thirty ounces in the course of an hour, though he had only drank half a

* Simpson De Re Medica, p. 183, quoted by Percival. Ess. Med. & Exper. Vol. II. p. 162.

glass of wine in the interval. "There are many cases," says Dr. Robertson, from whom I have borrowed the above instance, "where the quantity of urine voided by a diabetic patient, is not lessened, even when the skin has been covered with greasy applications; and in such instances, the excretion in this way has been found to exceed the whole injesta: in these cases, the absorption of water could only take place through the lungs.* The following fact gives, likewise, an additional confirmation of this opinion. Several people, who were under the necessity of passing their time in a very damp situation, perceived that they had regular calls during the night to pass urine; which took place repeatedly when their skins were covered with perspiration, and after a dinner of animal food, with a few glasses of wine, and when no supper, or any liquid had been taken for many hours before going to bed. This circumstance continued to be the case for several weeks, till the increasing temperature of the atmosphere rendered their situation somewhat drier.†

Goodwin thought he had observed a considerable absorption of nitrogen or azotic gas in respiration; but his experiments on this subject were not decisive, and were consequently disregarded. The later experiments of Mr. now Sir Humphrey Davy, put the fact beyond a doubt; and if any confirmation of it were wanted, it is furnished by the experiments of M. Pfaff. It is remarked by the editors of the Medical and Chirurgical Review, that the azote or nitrogen absorbed during respiration, enters into the composition of the fluids, and serves to render them more highly animalized or azotized. In this way, say they, we may account for the transformation of chyle into blood, during its passage through the lungs. Besides, in animals exclusively herbivorous, whose muscular fibres consist of a great proportion of nitrogen in a solid state, there is no other way of satisfactorily accounting for the entrance of this element into the composition of the body, except from its absorption from the atmosphere. It is related by Dr. Kiel that a young

* The argument which the Doctor draws from this fact, though plausible, is not conclusive. For we know that in diabetes there is a rapid wasting of the body, and we therefore conclude that the solids themselves are melted down, taken up by the absorbents, and carried off by urine; so that unless the quantity of urine voided exceeds both the injesta and the wasting of the body, making due allowance for pulmonary and catamous perspiration, we cannot reasonably suppose that any absorption has taken place by the lungs or skin.

† Robertson's History of the Atmosphere and Epidemics, Vol. II. p. 301.

man gained, after much fatigue, during the space of one night, sixteen ounces. The vapour of melted lead will excite the colica pictoneum in those who are exposed to it, as is the case with plumbers, potters, and shot makers; and globules of mercury have been found in the bones of the skulls of those whose occupation obliged them to be exposed to the vapor of this metal. It has also been ascertained that the absorbing power of the pulmonary lymphatics is much increased by long fasting and a state of inanition. From which we deduce the important practical conclusion, that it is dangerous to expose one's self to infection with an empty stomach.

We know that the noxious exhalations which produce fever are in an aeriform state; they must, therefore, necessarily be received into the lungs in respiration, and by being immediately applied to the mouths of the pulmonary absorbents, may thereby be received into the mass of circulating fluids. It does not appear that the absorbents possess any particular appetency, or discriminating power, whereby they reject such substances as are deleterious, and receive only those which are salutary; were this the case, mankind would be exempt from an infinite number of calamities; but we find that these delicate vessels absorb with apparent indifference the blandest lymph, the venereal or pestilential virus, the small pox infection, or any other matter of sufficient tenuity for their reception.*

It has been generally supposed that carbonic acid gas proves destructive to animal life, merely by its negative properties in excluding vital air, and thereby preventing the purifying operation of the latter on the blood as it circulates through the lungs. It appears, however, that the deleterious property of carbonic acid gas is owing, not so much to its negative qualities, as to its absolutely deleterious property. It is stated by Mr. J. Hunter, that fishes will survive longer in water deprived of air, than in that which is impregnated with carbonic acid; and it is observed by Dr. Black, that when the respiration of birds is prevented by closing their nostrils with suet, they live longer in carbonic acid gas, than when they are permitted to inhale it. It would appear, therefore, that in such instances carbonic acid, or the carbon separated from the oxygen, enters the circulation and acts immediately upon the heart and arteries. The venous blood returned to the heart abounds with

* The lacteals and lymphatics, says Mr. Cruickshank, take up the most irritating substances. Anat. of the Absorb. Ves. p. 123.

an excess of carbon, which it is the function of the lungs to separate, but if instead of this, it becomes still more highly carbonized, as by the respiration of carbonic acid, life will be more speedily destroyed than by a mere negation of the common atmosphere.

It is ascertained that vegetable, mineral, and morbid poisons are taken up by the lymphatic of the stomach and bowels. Of this, instances will be given hereafter. But to illustrate the fact that morbid poisons will act upon the general system when taken into the stomach, it may not be irrelevant to notice the following fact. A poor man is mentioned in the Medical Repository, who, unable to pay the expense of inoculation, and being himself ignorant of the process, procured a quantity of the variolous scabs, and having pulverized them, spread them plentifully on a piece of bread and butter, which he gave to his children, and with the desired success; we are further informed that the dog, also, who partook of the repast, was in like manner seized with the small pox.*

Admitting that the infection producing fever is received into the primæ viæ, the quantity to take effect must, to use a common expression, be infinitely greater than if received by the lungs: for we know that the stomach possesses the power of changing the qualities of substances taken into it, in such a manner as to convert them to a different nature.

* Med. Repos. Vol. I. p. 247. It may be considered as a physical fact, that, in general, the inferior order of animals, or the brute creation, are not subject to the same diseases from morbid poisons and from pestilential constitutions of the atmosphere as the human race; to this, however, exceptions are recorded by different authors. We are informed by a respectable writer, that in an epidemic season of the confluent small pox, turkeys, fowls and other poultry were carried off by the disease in great numbers, and had the same symptoms usually accompanying every stage of this distemper in the human species. *Holwell's account of the manner of inoculation, as quoted by Walker on Small Pox.* It is remarked by Dr. Rush, that malignant and mortal epidemics are often preceded by uncommon sickness and mortality among certain birds and beasts. They have both appeared among wild pigeons and cats in the United States. The mortality among cats, previous to the appearance of epidemics, has been taken notice of in other countries. Dr. Willan says it occurred in the city of London, between the 20th of March and the 20th of April, in the year 1797, before a sickly season, and Dr. Buneiva says it preceded a mortal epidemic in Paris. The same thing was observed in the plague which prevailed in Rome, B. C. 461, which, according to Livy, affected both men and cattle with equal malignity. And it is said by Dionysius of Halicarnassus, that the disease seized horses, herds of cattle, and flocks of goats and sheep. We are also told by Orosius, that the plague which originated in Africa, B. C. 126, was not confined solely to the human species, but that a general mortality of birds, cattle and wild beasts marked the progress of its destructive ravages.

Thus, in various instances, the variolous infection, (not, however, in the quantity above mentioned.) the virus of hydrophobia and of the venereal have been swallowed without producing any inconvenience or indisposition.* *Non gustu, sed in vulnere nocent*, says Celsus, "poisons do not prove injurious from being taken by the mouth, but from the infliction of a wound." Plenk observes, that the poison of vipers is taken with impunity into the stomach.† The families of the Psylli in Africa, and of the Marsi in Italy, were supposed to cure the bites of venomous serpents by the power of enchantment, or by some invulnerable idiosyncrasy of constitution; and what was then surprising to the vulgar, that they should suck out the venom of the wound with their mouths and remain uninjured, is divested of mystery by physiological knowledge.‡ It is said that the *woorara* poison may be taken into the stomach without any ill consequence ensuing.§

These facts do not prove absolutely that poison in any quantity taken into the stomach is innocent and free from danger, they only prove that the quantity received was not sufficiently great to withstand the neutralizing powers of the stomach. And there can be no doubt that had the quantity been much larger, the effect would have been as fatal as if it had been inserted into a wound.

It appears from the experiments of Fontana, that poison acts in proportion to its quantity and the size of the animal to be acted upon; that, for instance, the thousandth part of a grain is sufficient to kill a sparrow, by introducing the venom immediately into the muscle by incision. Supposing the sparrow to weigh an ounce, he calculates that twelve grains of venom will be necessary for the destruction of an ox of 750lb.; and two grains and a half to kill a man, supposing him to weigh 150lb.; that admitting a viper to contain two grains of venom, it will require the venom of six vipers to kill an ox, and nearly two to kill a man; but as the viper does not discharge all its venom at a bite, it may require twenty vipers, each biting only once, to

* Galen de Temperamentis, lib. iii. cap. ii. Mead's Works, p. 151. Fodre. Med. Leg. tom. iii. p. 674. Rush's Med. Inq. & Obs. Vol. III. p. 409. Hunter on the Venereal. Bell on the Venereal.

† Venenum viperinum ventriculo ingestum impune fertur. Toxicolog. p. 10. See also Boerhaave de Morb. Ner. tom. i. p. 207. Rhedi. Obs. on Vipers, &c. p. 17.

‡ See Mead's Works, p. 29. Plin. Hist. Nat. lib. vii. cap. 2. Ælian. Hist. Animal, lib. i. c. 57, and Lucan, lib. ix. ver. 891.

§ Dr. Bancroft's History of Guiana.

kill an ox, and five or six with the same restriction to kill a man.*

But it appears that it requires a thousand times as much to produce death when the venom is received into the stomach as when inserted in a wound. Thus six grains were necessary to kill a pigeon when the venom was given by the mouth; and according to the same calculation, five ounces, or the venom of 240 vipers, are required to kill a man in the same way.† It appears also from the experiments of M. Delile of Paris, that a larger quantity of the poison of the Bohon Upas, or the Upas Tiuete of Java, is necessary to destroy an animal when taken into the stomach, than when it is inserted into a wound. Such is the power of the stomach in changing, resisting or neutralizing poisons.—However interesting, it does not come within the limits of my present inquiry to examine and discuss the action of morbid poisons in all their various modes of operation; this much, however, was thought necessary in the investigation of the subject under consideration. It is not conclusively proved, however, from what has been advanced, that the infection of fever may not come to act upon the system through the medium of the stomach and bowels; it shows, however, that its chance of affecting the general system is much weakened, and that a large quantity is required to take effect when received into the stomach.

In support of the opinion that the infection is received by the way of the lungs, we have previously noticed (page 60) the circumstance mentioned by Dr. Lind, of the marines being suddenly taken ill while exercising on the South Sea beach; as also the instances mentioned by Lancissi,‡ of a company of gentlemen and ladies being suddenly attacked with fever, from exposure to marshy exhalations, whilst returning to Rome from an excursion of pleasure; likewise the instances of sudden death,§ and the cases of fever immediately produced in 114 persons by the vapor which issued from a coffin, mentioned by Pierre Cotte. Similar instances are quoted by Sir John Pringle, from Stow's Chronicle, of several hundred persons being suffocated and suddenly attacked with fever from the air of an infected prison.

It may be urged that in those cases where death or suffocation is instantly produced by exposure to noxious effluvia, the effect must be ascribed to their immediate operation on

* Fontana on Poisons, Vol. I. p. 286–7.
† Ibid.
‡ See page 60 of the present work.
§ See page 73.

the nervous system :* this is probable; for we know that in many instances the symptoms suddenly occasioned in this manner subside and disappear, without terminating in an established fever; and therefore conclude that the affection has been merely nervous; but when fever is the consequence of such exposure, a reference to the nervous system alone, will not explain the circumstance: for did these febrile agents act exclusively upon the nerves, it would be reasonable to suppose that no perceptible time would be necessary to elapse between the application of the cause and the appearance of the effect: for experience teaches us that stimuli, or agents applied to the nerves, evince their immediate operation: besides, were the action of these causes confined to the nervous system alone, should we not embrace an improbability in supposing that they could lie in contact with the nervous expansion, in the air cells of the lungs, or in the nose, trachea, or stomach, for the space of ten or fifteen days, and then, and not till then, exert, for the first time, their deleterious operation? In the meantime, what should hinder their being expelled with the same breath by which they found admission, or of being carried off by stool? If their mere presence in the lungs or stomach, without being taken into the circulation, were all that is required in the production of disease, instead of accumulating force, these miasms, like other agents of long continued application, would lose their efficacy.

It is not impossible, however, that febrile infection may, in a certain degree, find admission into the circulation by the way of the stomach and bowels; but, from what has already been said, the probability is, that under ordinary circumstances, this is not the channel of admission.

* It has been a received notion among some physiologists, that there was a shorter and more direct communication between the stomach and the bladder than the circuitous one of the lacteals and blood vessels. For the purpose of deciding this question, M. Fodera has performed some interesting experiments. See the *Medical and Physical Journal.* In one of these he introduced a catheter, with a cork adapted to it, into the bladder, and then injected a solution of the prussiate of potass and iron into the stomach; as soon as the salt was detected in the urine, (an occurrence which in one instance took place in ten, and in another at the end of five minutes,) the animals were instantly opened, and the prussiate was found in the blood of the vena cava inferior, of the heart, and of the aorta, in the thoracic duct and other parts. Should these experiments be confirmed by subsequent researches, the difficulty physiologists have encountered in explaining the quick transmission of fluid substances from the stomach to the bladder, will be obviated, in the demonstration of the rapidity of the absorption and progress of such substances through the ordinary channel of the lacteals or lymphatics and the sanguiferous system. In this way, also, might be explained the sudden operation of infectious miasms.

Fernelius says that what comes in contact with our breath, is carried through the lungs to that noble viscus, the heart, thence into the arteries, seizing at length upon every part of the body; disordering first the spirits, (*spiritus*) then the humors, (*humores*) and lastly, the substance of every part. (*Postremo substantium ipsarum partium labifactat.*)

CHAPTER V.

INQUIRY INTO THE SEAT OF FEVER.

Facts in support of the opinion that the Immediate Cause of Fever exists in the Circulating Fluids.

That the miasms of fever are received into the general mass of circulation, we have the strongest arguments for believing. We know that when the matter of small pox is inserted into the skin, a certain time is necessary for it to take effect, and as the skin abounds with absorbents, we have every reason to suppose that the variolous, as well as the venereal virus is received into the circulation, and communicates its properties to the mass of fluids. We can scarcely suppose that the symptoms which follow the infection of the small pox are merely the consequence of an impression on the nervous system. Can we believe that an almost invisible atom, barely sufficient to cover the point of a lancet, should lie inactive in the body for the space of a week, and then suddenly break out, as it were, in an explosion on the general system?

And if the essential operation of these morbid agents is upon the brain and nerves, why are the heart and blood vessels excited into action? Shall we, with Dr. Cullen, confess our ignorance at the onset of the inquiry, and refer the effect to the conservative interposition of the *vis medicatrix natura?* We know that a change of the nervous does not necessarily involve that of the sanguiferous system. We frequently see the body agitated with convulsions, or made

rigid with the lock-jaw or tetanus, without communicating febrile commotion to the heart and arteries. But although the brain, nerves, and muscular fibres of the limbs may be violently affected without disording the muscular system; yet the converse of this does not hold equally true, and for a very obvious reason: because the blood is the stream and fountain of life, and the source of health, nourishment, and support to every part of the animal frame. If the blood be altered from its healthy state, not only the heart and arteries, but every part of the general system partakes of the disorder.

That the blood is subject to vitiation, there can be no doubt. This I have attempted to demonstrate in another work, when treating of scurvy.*

Suppression of urine, on some occasions, gives rise to the symptoms of violent delirium and fever, attended with an urinous smell in all the excretions from the patient's body. It is remarked by Dr. Ferrier, in his Medical Histories and Reflections, as being a well known fact, that in fatal cases of ischuria, when the patient dies comatose, the ventricles of the brain are filled with a fluid which has the sensible qualities of urine. And it is remarked by Bromfield, that if the cause of ischuria is not immediately attended to, a violent fever comes on, with retchings to vomit, sometimes coma ensues. A temporary relief is frequently obtained by a profuse sweat coming on, which is extremely offensive, from its strong urinous smell.† "A sufficient attention," says Richerand, "has not hitherto been given to the symptoms of urinous fever, an affection occasioned by a too long retention of the liquid in the cavity of the bladder." I have frequently had occasion to observe that no disease gave better marked signs of what physicians call putridity. The urinous and ammoniacal odour exhaled from the whole body in sickness, the yellow greasy moisture covering the skin, the great thirst, the dryness and redness of the tongue and throat, the frequency and irritation of the pulse, joined to the softness and flaccidity of the celular membrane, all indicate that the animal substance is menaced with speedy and prompt decomposition.‡

It has been previously remarked, that the lymphatics absorb indifferently every substance that is presented to them of sufficient tenuity to be received by their orifices; and

* See Observations on the Topography and Diseases of Louisiana.
† Bromfield's Chirurgical Obs. and Cases, p. 293.
‡ Richerand's Physiology, p. 95.

in this way the blood becomes impregnated with the odour and qualities of substances taken into the stomach, or inhaled in respiration. Mr. Menghini found by experiment, that the blood of persons who take martial preparations, contains more iron than it does in an ordinary state. And Mr. Lorry observed, that the urine of a sick person, to whom had been exhibited iron in a state of extreme comminution, was colored by nutgalls, thereby demonstrating the presence of iron.*

The liquor amnii was found tinged with saffron in a woman who had used a large quantity of this article.†

The use of indigo imparts its colour to the milk; and madder and the Indian fig give it a red tinge.‡ The exhibition of wormwood renders the milk bitter, and thyme, garlic, and onions impregnate it with their odours.§

A cathartic given to the nurse purges the child; and spirituous liquors taken by the former, will occasion intoxication and convulsions in the latter;‖ and it is related by Dr. Percival, on credible information, that cabbage and other flatulent vegetables, taken by the nurse, have occasioned

* It is the function of the excretory organs to separate such excrementitious substances from the blood as are incapable of being animalized, and are consequently unfit for the nourishment of the body. The lighter and more attenuated matters, and such as are capable of being volatilized by the animal temperature, pass off by the skin and lungs: in these excretions we may discover, when the persons have taken the substances that afford these odours, the smell of garlic, onions, assafœtida, sulphur, and most of the essential oils. Substances of a gross consistence, yet being soluble in the animal fluids, as the various earthy and saline matters, which have either lost by age the qualities which rendered them serviceable in the animal economy, and have become too much animalized by long continuance, or which, when taken into the stomach, are unfit for nutrition and incapable of undergoing assimilation, such substances are principally determined to the kidneys and pass off by urine.

The conversion of alimentary substances into animal matter, is chiefly effected by the loss of its carbon; which change is, in a great measure, accomplished in the lungs, by the combination of the oxygen of the air with the superfluous carbon of the blood, forming carbonic acid gas. Between the function of the skin and that of the kidneys, there is a great analogy, so that when the one is increased, the other is diminished, and *vice versa*—In warm climates, and in the summer season, the perspiration exceeds the secretion of urine, which is smaller in quantity and high colored, abounding with alkaline salts. It is likewise worthy of remark, that in warm climates the perspiration is more acrimonious than in cold ones. Hillary says that in hot climates the sweat is so very salt and acid, as to taste like salt or spirits of hartshorn, mixed with water in considerable proportion. *Hillary on the Diseases of Barbadoes.* This observation, with some abatement, is correct.

† Haller. Elem. Physiol. Vol. iii. de fœtu.
‡ Ibid Vol VII. de lacte.
§ Ibid Vol. III. Numan's Chemistry, p. 569.
‖ Boerhaave Proelect. sec. 690. Haller Elm. Physiol.

gripes in the child.* It is said by Boerhaave, that ale, taken by a fasting nurse, has in a short time been discharged by the breast.† Gmellin states that the milk of such as are salivated, will occasion salivation in a child.

By slow evaporation, Dr. Hunter discovered globules of mercury in the milk of a woman laboring under salivation.

It is proved by the experiments of Dr. Alexander, that nitrate of potash retains its nature and properties after it has gone through the circulation.‡

A purgative quality is given to the milk of cows which have fed upon hedge hyssop. It is related by Diascorides, that the milk of goats that feed on the scammony plant and spurge, proves cathartic. We are told by Haller, that field fares, by feeding on the berries of the rhamnus catharticus, are found purgative to those who eat them.§

The medicated qualities communicated to the milk by the vegetables on which animals feed, was not unknown to the ancients; and such was their conviction of their efficacy in this way, that in some diseases they prescribed the milk of animals which had fed on vegetables, proper for the cure of those diseases. "According to the strength and difference of the food," says Crantz, "such is the diversity of the milk; from the former, the chyle is good or bad, bitter or sweet; so also, is the milk from the latter; as are the injesta, so is the chyle; as is the chyle, such is the milk asserted to be, and is confirmed by experience."‖ The milk of goats which have fed on astringent and balsamic vegetables, has been recommended in diarrhœa; and cows having fed upon lettuce, pelatory, madder, or purslain, afford milk so imbued with the unchanged qualities of these plants, as to communicate their usual effects to such as use the milk thus impregnated.¶

In jaundice the bile is taken into the mass of the circulating fluids: and Maribilli says the urine of a person laboring under this complaint, has an intensely bitter taste. In jaundice the urine has an orange yellow colour, and communicates the same tint to linen. Muriatic acid renders this urine green, and thus detects the presence of a little bile.**

* Percival's Essays, Vol. I. p. 257.
† Praelect. § 688.
‡ Experimental Essays.
§ Med. and Chirurg. Cases.
‖ Crantz M. M. p. 80.
¶ Percival's Essays.
** Thompson's Chemistry p. 653.

The urine is sometimes changed to a bloody hue by taking the extract of logwood.* Beets possess the same property. It is impregnated with the odour of asparagus, carrots, parsnips, fennel, the oil of savin, turpentine, &c. when these substances have been taken; the smell of the latter is sufficient to communicate the odour. A species of fungus is found to retain its intoxicating quality, after passing into the urine.† The urine is coloured for many hours after taking rhubarb.

It is remarked by Dr. Russel, of the people of Aleppo, who take large quantities of oil, that the same is seen to exude through the skin.

Ichthiophagous birds and hogs fattened upon fish, as they are in some places, have a disagreeable fishy taste. The odour of carrion is communicated to the flesh of vultures.

It has been disputed whether the poisonous qualities of fish, in certain situations, are communicated to the flesh while the animal is alive; and it has been affirmed that the poison which is taken in with their food, transudes through the bowels after death; and that when the animal is dressed immediately upon being taken, its flesh is free from any deleterious quality. Dr. Thomas, Dr. Buckley and Dr. Hodge, are the advocates of this belief.‡ It is very doubtful, however, whether the opinion of these gentlemen is correct: from the analogy of the instances already mentioned, we see no reason to doubt that poisonous matter taken in with the food, may likewise be communicated to the flesh of the animals feeding upon it; it is evidently not poisonous to the animals in which it is found, otherwise they could not eat the substances which afford it with impunity; and from the redundancy in which it exists in the stomach and bowels, there can be no reasonable doubt of its entering the circulation, and thence imparting its poisonous qualities to the body generally. There is a weed or vegetable which grows in the river and creek swamps and low grounds in the state of Alabama, of which cattle are very fond, and which so thoroughly imbues every part of the animal with its fœtid and disagreeable odour, that the effluvium is perceptible at a considerable distance; the same odour is communicated to the milk and flesh, which are thereby rendered offensive and unfit for use; the bones and marrow are also tainted with the the flavour of this noisome weed. There is ano-

* Percival's Essays.

† Haller Elm. Phys. Vol. VII. de urine.

‡ Memoirs of the Lond. Med. Soc. See also, Caldwell's Collection of Theses, Vol. II.

ther vegetable which grows in the northern parts of this state, near the Tennessee river, which imparts so poisonous a quality to the milk of cows, as to prove fatal in a short time, to such as unfortunately make use of it.* Dr. Musgrave found that by injecting solutions of indigo and stone blue into the small intestines of dogs, the lacteals and thoracic duct became coloured with the injection.†

The bones of the Canada porcupine, during winter, are of a greenish yellow, owing, as is supposed, to the bark of the pine on which the animal feeds in that season of the year.‡ Globules of mercury have been found in the cells of the bones.§

"A great many substances," says Dr. Fordyce, "may enter the lacteals along with the chyle, even solids reduced to fine powder. When indigo has been thrown into the intestines of sheep, I have seen, says the Doctor, the chyle rendered quite blue: now indigo is not soluble in water, but is a solid reduced to a very fine powder. So musk gets into the chyle, giving it a strong smell, and a great variety of other substances of various colours, various tastes, and various smells; each of them giving colour, or taste, or smell, to the chyle."‖ Alkaline medicines, taken internally, are discoverable in the urine. This was observed by Sir John Pringle, in a person who had been long under a course of Mr. Stephens' medicine. This gentleman's urine had not only the volatile smell, but strongly effervesced with the common acids.¶ The same observation is confirmed by Haller** and Dr. Percival.††

It is said that the plague and other diseases have been communicated by injecting the bile, blood, urine, &c. of the

* In cases of poison, the milk seems to serve as an outlet for the peccant matter, and thus the animal escapes uninjured. This has been observed in many places in cows giving milk, which remain exempt from disease in situations highly destructive to horses and to cows not giving milk. A disease originated among the inhabitants of the state of Ohio, from the poisonous quality of the milk of cows, which ran in the woods, and in uncultivated pastures. Those who refrained from the milk, were not affected with the disorder.—*Med. Repos. Vol. XV. p.* 92. I am aware, however, that the constitutions of quadrupeds are different from those of the human race, and that substances that would prove poisonous and deadly to the latter, are eaten by the former with impunity. Thus, I have frequently seen goats and cattle feeding with avidity on the leaves of the datura stramonium without experiencing any ill effects.

† Philos. Transact. Abr. ch. 4. part 2. p. 76.

‡ Pennant's Arctic Zoology, Vol. I p. 126.

§ Haller Elem. Physol. Vol. I.

‖ Fordyce on Digestion.

¶ Pringle on the Diseases of the Army, p. 116.

** Elem. Physol. Vol. III. p. 9.

†† Ess. Med. and Exper. Vol. III.

deceased into the vessels of the uninfected. From the experiments of Dr. Deidiere,* it appears that bile taken from persons dead of the plague, and either poured into a wound made on purpose in different dogs, or injected into the veins, never failed, in many trials, to produce in all the symptoms of the plague, even the external ones, of buboes and carbuncles. One dog, on which the experiment succeeded, had been known, for three months before, to devour greedily, the corrupted flesh of infected persons, and pledgets taken from pestilential ulcers, without receiving any injury. It appeared afterwards, from some experiments made by Dr. Cousier,† that not only the blood, but even the urine from an infected person, infused into the crural vein of a dog, communicated the plague. And in the experiments of Dr. Diediere. afterwards made, pestilential bile was swallowed by dogs without any injury.‡ Mr. Colman of the Veterinary College, assures us that he has produced the glanders, by transfusion of blood, both in the horse and the ass.§

There is this striking difference between morbid and other poisons; the former when admitted into the body, even in a very small quantity, so small indeed, as at first to give rise to no uneasiness, yet after a certain residence develope their peculiar influence in the production of disease, and not unfrequently in the destruction of animal life. This peculiarity is owing to the power they possess, of inducing a gradual change in the fluids of the body, converting a portion of the circulating mass into their own nature. If the portion thus assimilated is of a gross consistence and acrimonious quality, and not easily perspirable, it is lodged under the cuticle in the form of pustules, or is arrested in the lymphatic glands of the groin, arm-pits, &c. forming buboes and glandular swellings. When it is lighter and of a more soluble nature, at a certain period it is carried off by perspiration, urine and stool. Animal poisons, and the same rule applies also to those of the mineral and vegetable kingdoms, on the contrary, possess no such assimilating property, and where the quantity or quality of the poison has not been sufficient to produce death in the first instance, the patient generally recovers from the effects, which instead of being aggravated are mitigated by time: for should the poison not prove fatal, though not immediately eliminated from the body, we

* Philos. Transact. Vol. XXXVII.
† Vide Dissertation Sur Contagion de la Peste, a Toulouse, 1724.
‡ Mead on the Plague, Preface, p. 160–1 & 2.
§ Cox's Phil. Med. Mus. Vol. I. p. 352.

know that the system becomes gradually less sensible to habitual impressions: so that what at first was capable of exciting great commotion, shall at length become innoxious. The following fact may serve to illustrate this circumstance. It is a case related by Dr. Barstow, of Wilkesbarre, Penn. of a Mrs. Beeman, who was bitten by a rattlesnake in the summer of 1801. After some considerable degree of the common consequences of such an event had occurred, she at length recovered; at the full time of delivery she was safely put to bed. The child was apparently healthy; but immediately after allowing it to suck, it assumed the hues of a rattlesnake, swelled very much, and soon died. One puppy and four lambs shared the same fate from sucking this person. The woman all this time was as well as usual, and in convalescence from child birth. The fact is confirmed by several persons of veracity who were witnesses of this phenomenon. Te next child which Mrs. Beeman had was not affected by the milk.*

From such facts would it not appear weak and absurd to say that the substances producing those symptoms and effects do not enter the blood in their crude state, and with their natural properties; but *that they are digested and form an assimilated portion of the chyle?* Which, I would ask, presents the greatest difficulty, to suppose that these various substances are decomposed on entering the blood, and afterwards recomposed in the excreted fluids of the body, or that they remain unchanged, from the time of their being taken in, till their final elimination? If their properties are once destroyed, for what purpose and by what powers are they restored? It will be difficult for the advocates of an opinion so contrary to the evidence of matter of fact to answer this question. The authority of Boerhaave, Haller and Mead may be adduced to show in opposition to theory, that crude mercury, in the form of globules, has been seen flowing from the body with the stream of blood. Dr. Lind relates, that in the yellow fever the serum of the blood was of a yellow tinge, and that a person by curiosity tasting it found it bitter.†

Numerous instances are recorded of the small pox and other diseases being communicated to the fœtus in utero. The small pox has even been communicated to the fœtus and the mother remained uninfected, from having previous-

* Phil. Med. Mus. Vol. III. p. 61.

† Lind's First Paper on Fever and Infection.

ly passed through the disease.* That there might be no doubt as to the reality of the disease, the small pox has been communicated to others by inoculating with the matter of children thus infected. We can scarcely suppose, with any degree of probability, that disease in these instances was communicated through the medium of the nervous system. Various other cases of a similar nature are related by different authors.† The plague has been communicated in the same manner. Dr. Russel gives an instance of a child born in the fifth month of pregnancy, which was covered with buboes.‡ The same thing has taken place in the venereal.§ Dr. Zimmerman gives an instance of dysentery communicated from the mother to the child or fœtus, which was born with every symptom of that complaint.‖ And in numerous instances the child has sucked the venereal from the infected nurse.

It can scarcely be doubted that the fever in small pox is occasioned by the variolous poison in the circulating fluids, and which nature throws out upon the surface of the body; at which time the fever subsides, but is again excited by the absorption of the variolous matter from the pustules. We are informed of an Eastern custom by which this secondary fever is prevented, which consists in puncturing the pustules with a sharp thorn, and absorbing the matter with a soft calico rag dipped in warm milk and water. In this way, we are told, the natives are frequently employed for many hours. "And when it has been zealously persevered in," says Holwell, "I hardly ever knew it fail of either entirely preventing the secondary fever, or mitigating it in such sort as to render it of no consequence. In various instances I have seen the pustules in the contiguous kind, upon being sufficiently opened, fill again to the eighth time; in the very distinct sort, they will not fill again more than

* See the cases mentioned by Dr. Morton, Phil. Trans. Vol. XLVI. p. 233; by Dr. Jenner, Lond Med. Review, Vol. II. p. 396; by Wm. Forbes, Edin. Med. & Surg. Jour. Vol. III. p. 307.

† By James Lind. Edinb. Med. & Surg. Jour. Vol. III. p. 55; by Sir Wm. Watson and Dr. Van Rosenstein, Philos. Trans. Vol. XLVI. where the children are said to have passed through the disease previous to delivery. Several cases are likewise mentioned by Dr. Pearson in the Philos. Trans. by Mr. Rait. Med. Comment. Vol. XIII. p. 313; Med. & Phys. Jour. Vol. V. p. 536, and by Haygarth on Small Pox.

‡ Russel on the Plague. Gibbon's Decline and Fall of the Rom. Emp. Vol. V. chap. xliii.

§ Bell on the Venereal, p. 376. Swediaur on the Vener. Tom. II. p. 10: Foot on the Vener. p. 472.

‖ Zimmerman on Dysentery, p. 19.

once or twice, and sometimes not at all, which was a plain indication, that the whole virus of the disease was expelled by the first eruption." This well authenticated account of the Eastern practice, says Dr. Walker, who quotes this passage, puts it beyond a doubt, that different quantities of the variolous ichor are generated in the system, in different kinds of the small pox.*

In the mildest cases of the plague, the morbid matter shows a particular tendency to accumulate in the glandular parts of the body, thus relieving the rest of the system from the general diffusion of pestilential virus.

If in many of the cases of animal, vegetable and morbid poisons hitherto mentioned, the substances thus affecting the system or circulating fluids, are not discoverable in the blood, we are not to infer from this circumstance that they do not exist there. The blood itself is a viscid heterogeneous substance, and any extraneous or excrementitious matter to be perceptible in this fluid must abound in too large a proportion to be compatible with animal life. Thus Dr. Seybert injected one drachm of putrid blood and forty-five grains of volatile alkali into the veins of dogs; "but," says he, "the blood gave no signs of alkali." Experiments of a similar nature have been repeated by others and with the same result. That the alkali existed in the blood in the experiment of Dr. Seybert, there can be no doubt; that it was not detected was owing to the imperfection of the tests. Experiments and demonstration are certainly the best and most infallible guides to improvement; but in the present state of our scientific researches, the nicest and most important circumstances must evade the grossness and imperfection of our tests.

* Walker on Small Pox, p. 87.

CHAPTER VI.

PERIOD OF INFECTION.

Of the length of time that elapses from the Period of Exposure till the appearance of Disease.

The time which elapses from the period of exposure to the full developement of disease, is different in different cases; as depending on the quantity, concentration and virulence of the morbific matter received. In many instances the attack is instantaneous; in others, symptoms of disease do not appear till fifteen or twenty days after exposure; and Dr. Haygarth allows that persons may be affected as late as the 76th day after receiving the infection. The confluent small pox has been known to appear within twenty-four hours after exposure to contagion. In the inoculated small pox, as the quantity of matter inserted is very small, and pretty uniformly the same, the disease makes its appearance about the same period; that is, from the seventh to the eleventh day after inoculation. A case is mentioned, however, in the Philadelphia Medical Museum, of a child in whom the disease did not appear till the expiration of a year after inoculation.

In fevers of the endemic kind, from one to three days may be considered as the ordinary time. Mr. Bertrand says, that no cases of the plague occurred at Marseilles after the thirty-fifth day. At Aleppo, according to Dr. Russel, none occurred after the ninth or tenth. But as in these latter instances the writers speak of personal contagion, no conclusions can be drawn from their accounts.

"The air of a sick apartment," says Dr. Lind, "when in a close unventilated place, becomes often so highly tainted that I have known six attendants affected by it in less than twenty-four hours."* The fever which prevailed on board the Nottingham East Indiaman, in the year 1766, affected those forty men only who had slept on shore in the island of

* Lind on the Diseases of Seamen, p. 83.

Jolina twenty days before.* From comparing many instances, says Dr. Lind, of people who have slept on shore during the sickly season, and in consequence of it, who alone have been taken ill out of the whole ship's company then lying in an open road, it appears that some are immediately seized with sickness or delirium, many are not seized with them till they have been on board for two or three days; several have been only slightly indisposed for the first five or six days; and in a few, the symptoms of indisposition have not appeared before the tenth or twelfth day.† "The seeds of fever," says Dr. Rush, "when received into the body, were generally excited into action in a few days. I met with several cases in which they acted so as to produce a fever on the same day in which they were received into the system, and I heard of two cases in which they excited sickness, fainting and fever within one hour after the persons were exposed to them. I met with no instance in which there was a longer interval than sixteen days between their being received into the body and the production of the disease."‡

Besides the quantity of infection received into the body in influencing the earlier or later appearance of the disease, much will depend upon the state of the constitution disposing it to be more or less easily affected and disturbed by the morbific matters.

After infection has once entered the circulation, it is some time before it can be expelled from the system by the natural emunctories of the body: during this interval of suspense between the time of its reception and the production of disease, it seems to lie dormant, and in many instances may be expelled by the excreting organs without the production of disease, provided no exciting cause rouses it into immediate activity. In an infected and sickly atmosphere, where every breath is loaded with noxious effluvia, the body may be supposed to be always impregnated with the seeds of disorder; or, in other words, that it is in a constant state of predisposition to disease, requiring only some occasion of irregularity, exposure, or excess to give activity to the dormant infection. "I have remarked," says Dr. Lind, "many seamen who belonged to infected ships, after having been several days on land, to be seized with the ship fever, by over eating, getting drunk, quarrelling, or the like

* Observations on the Bilious Fevers usual in Voyages to the East Indies, by James Badinach, M. D. Med. Obs. & Inq. Vol. VI.

† Lind on the Diseases incidental to Europeans in Hot Climates, p. 194.

‡ Rush's Inq. & Obs. Vol. III. p. 86.

excess, and when they were sent to the hospital I have found them covered with petechiæ."*

Fracastorius, treating of the manner in which infection enters the body, speaks of the difficulty with which it is eliminated as follows: "With the air which is inspired, the mingled semina of contagion at the same time find admittance; which, when once introduced, are not expelled with the same facility by expiration, since they are agglutinated to the fluids and membranes, and sometimes even to the animal spirits, and are thus carried to the heart in an inimical condition."†

CHAPTER VII.

INQUIRY INTO THE THEORY OF FERMENTATION AND PUTREFACTION.

Critical Examination of the Doctrines of Fermentation and Putrefaction, in Explanation of the Phenomena of Fever.

Much has been written about fermentation in diseases, and much misunderstanding has arisen on the subject from the different acceptations of the term by different writers, as well as from the intrinsic obscurity of the subject itself. The opinion is of very antiquated date, and among the ancients signified nothing but a vague and indefinite idea of an obscure and incomprehensible matter of speculation. The following quotation from Etmuller may serve as an example on this occasion. "The eating of summer fruits," says he, "frequently causes fevers. Now these are endowed with a notable property to ferment; the *rotten fevers*, mentioned by the ancients, are only explicable by the doctrine of fermentation; for no living thing can be properly entitled to putrefaction, unless by it be meant, a turbulent

* Lind on Fever and Infection, p. 64.
† Fracastorius de Contagione, Fo. 7. Feb. 109. Pauli p. 71.

confused motion, proceeding from the dissolution of contrary salts; as that of spirit of vitriol and oil of turpentine." Thus, from what we can gather, Dr. Etmuller seems to think that in the production of fever, fermentation takes place in the fluids of the animal body, from the use of fruits, in the same way that this process is commenced and carried on in a keg of beer. And in the *rotten fevers*, the fermentation is more confused and violent from the dissolution of contrary salts.

But such antiquated notions are inconsistent with the present improved state of physiological science; and it is certain that in the blood of the living body no fermentation, either of the vinous, acetous, or putrefactive kind ever takes place, because neither wine, vinegar nor putrid gases are ever discovered in it, as the result of such fermentation. The different stages and kinds of fermentation may take place independent of each other; thus when mucilage abounds, the acetous fermentation occurs; when the saccharine principle predominates, the vinous; and when gluten is proportionably greatest, the change is that of the putrefactive fermentation; the latter is that of dead animal matter in general: but as the vital principle is incompatible with either of these processes in the circulating fluids, neither of them can be admitted in the explanation of changes connected with, and incidental to the living body.

We have every reason to conclude that morbid poisons, in producing disease act by the power of assimilation; that is, of converting a portion of the animal fluids to their own nature. This is demonstrated in the small pox, chicken pox, lues, &c.: but to relieve, as we are told, the poverty of language, this change in the fluids has been called fermentation; the word, however, is exceptionable, inasmuch as it gives rise to erroneous associations and verbal disputations. Mr. Moore, in his Essay on the Materia Medica, page 217, speaking of the circumstance under consideration, says, "It appears more similar to fermentation than any other operation in nature; but there is one striking difference, namely, ferments only hasten a process that naturally would have taken place. For example, leaven quickens the fermentation of paste, but paste naturally ferments, although it requires a longer time than when mixed with leaven. But common pus or blood has no tendency to form venereal virus." Dr. Adams, in his Essay on Morbid Poisons, speaking of the doctrine of fermentation, observes, that "if this be called reasoning, it will not be difficult to prove that a man and an image of rye dough are the same thing.

In fermenting farinacia, does it alter the properties of the fermenting substance what ferment is used. If we express the juice of the grape, and add the the yeast of malt to it, do we make beer, or *vice versa*."

Vander Mye,* Fernelius,† Morton,‡ Haller,§ Pringle,‖ and Dr. Gregory,¶ all mention the offensive smell, stench, and fætor of the fluids of the body and of blood drawn in malignant diseases, as the plague, small pox, jail fever, &c. and as a further confirmation of its putridity, notice its fluid and dissolved appearance. The same opinion has been embraced and advocated by some physicians of the present day, who contend that in malignant diseases there is an actual putridity in the fluids of the body: others limit the degree of this condition, by calling it *a strong tendency to putrefaction*.— It requires no great ingenuity to show that this opinion is founded altogether in error; and that what are called putrid diseases, do not owe their origin to a putrid ferment in the mass of blood. Though the causes of fevers originate from putrefaction, it does not thence follow as a fair inference and conclusion, that the system affected by such causes must be imbued with a putrid taint, or that the proximate cause of those diseases exists in the generation of the putrefactive process in the fluids of the animal body.

Dr. Alexander found,** by repeated experiments, that the corrupt and offensive air of a jakes, abounding with the miasmata of putrefaction, resisted the putrefaction of animal and vegetable substances, and preserved them sweet longer than the open uncorrupted atmosphere. So, that admitting the susceptibility of living and dead matter to be acted upon by zimics, ferments, and anti-zimics, to be the same, as the idea of *a putrid ferment* implies, instead of producing a putrescency of the body, or a tendency to putrefaction, the noxious effluvia of decomposition, from their antiseptic property, should impart health to the fluids and soundness to the solids.

In scurvy, which has been called a putrid disease, so far are the fluids from being in a state of putridity, that from the experiments of Dr. Lind, it appears that blood drawn from scorbutic patients corrupts no sooner than the blood of heal-

* De Morbis Bredensis, p. 14.
† De Febribus, cap. v. p. 246.
‡ Pyretolog. p. 26.
§ Elem. Phys. tom. ii. p. 85.
‖ On Jail and Hospital Fever, p. 26.
¶ Conspect. Med. § 534.
** Experimental Inquiry concerning Putrid Diseases.

thy persons; and that flesh steeped in the serum of similar blood, continued sweet and free from taint, as long as in the serum of persons in health.* Besides, to suppose any degree of putrefaction during the existence of animal life, is to presume a condition incompatible with living organized matter; such a condition would put a period to our hopes, and render the efforts of the physician unavailing; for when once putrefaction has taken place, the restoration of health is no longer within the reclaiming power of medicine; the animal substance is lifeless and disorganized, and mixes with its kindred elements.

Putrefaction is attended with the evolution of a great quantity of elastic gases; if, therefore, this process took place in morbid conditions of the body, we should expect to find the blood vessels inflated and distended with air: but nothing of this kind has ever been observed in diseases. It is true the bowels are sometimes inflated in malignant fevers, but the same thing happens in other disorders, the colic for instance, and not unfrequently occurs in healthy conditions of the system.

The offensive odour of the body and the speedy putrefaction after death have been adduced as arguments in favor of a state of putrescency in malignant diseases: but, as I have shown in my treatise on scurvy, the first affords no argument to the advocates of this opinion, as provi; g nothing more than that the excretions are in a morbid state; the same thing is observable in most fevers, and is particularly striking in persons laboring under salivation. But in all these instances the odour is different from that of putrefaction.

The partial mortifications that sometimes take place in malignant fevers, afford no argument in favor of a state of general putridity; they are merely a symptom of universal debility, and of the failure of the circulation in remote parts of the body, and are as frequent in diseases where equal debility prevails as in malignant fever.

Nor does the body putrefy sooner after death from typhus, than it does in other instances, where the vital principle is equally exhausted. It was observed, indeed, by Lind junior, Hamilton and Moore, that putrefaction proceeds more slowly in the bodies of typhus patients than in others. Whatever exhausts the vital principle has a tendency to accelerate putrefaction. It is from the exhaustion of this principle, and not from any putrid ferment present in the

* Lind on Scurvy, Postscript, p. 513.

blood or any other part of the body that putrefaction is accelerated after death. It is from this cause, and not from the presence of any putrid ferment, that animals exhausted in the chase soon become putrid after death; the same thing takes place in those killed by lightning; which occasions the total exhaustion of vitality in every part of the system; and as soon as vitality is destroyed, the process of putrefaction commences. It is from the deleterious property of carbonic acid gas, that those who die of asphyxia from sleeping in a close stove room, soon putrify and undergo rapid decomposition. We are told by Baron Larrey, that when the asphyxia, from the action of carbonic acid gas, does not terminate in this fatal manner, those who have been acted upon by its causes are rendered liable to a putrid nervous fever, from which they have a tedious and difficult convalescence. When the disease has been very severe, the skin of the most prominent parts of the body falls into gangrene and slaughs.* It can hardly be supposed that in such instances, carbonic acid gas acts as a putrid ferment on the living animal body. The Samiel wind seems to destroy life by suffocation, thereby increasing, as in cases of exposure to carbonic acid gas, the carbon in the blood. Chardin relates that people killed by this wind, seem as if they were asleep, and that their limbs are easily separated from their bodies, even by handling them. Volney also states, that a person killed by the *Kamsin wind*, remains long warm, swells, becomes blue, and is easily torn.

As the febrile poison is immediately applied to the vascular system of the circulating fluids, it is not surprising that they should more especially suffer, or lose their tone together with their power and energy of action. It is upon the healthy condition of the blood that the health and soundness of every part of the system essentially depends. In proportion as the cause of fever is violent and powerful, in the same degree is the vitality of the body more rapidly impaired and exhausted; and in proportion to the exhaustion of the vital principle is the tendency to putrefaction. The flesh of animals that are killed in the ordinary mode retains a considerable portion of the *vis insita*, or inherent principle of vitality, even after the body is dressed and dissected; it is this remains of vitality that preserves it sweet and untainted; as soon as this is extinct it begins to putrefy and becomes offensive. The flesh of animals exhausted in the chase or by baiting, has lost a considerable portion of the

* Larrey's Memoirs, Vol. II. p. 129.

vital principle, from the violence of the exercise, previous to their being killed; hence the flesh is soft and tender, and runs speedily into putrefaction: the same thing often takes place in yellow fever, from the almost total extinction of the vital principle before the patient has ceased to breathe. In those who died of the pestilence in Natchez, in the summer and autumn of 1823, the muscles and flesh of the body were so tender and putrid that they separated from the bones upon handling them, so as to render it impossible to *lay out* the corpses in the usual manner; and the only way in which the bodies could be managed, was to lift them into the coffins in the sheets they died in, as soon as they had ceased to breathe: the whole body appearing to be completely putrid and gangrenous immediately after death.

Nor is the dark colour and dissolved state of the blood any sign of putridity; it only indicates that this fluid is in a morbid condition. The blood in typhus resembles, in appearance and consistence, that of the vena portæ, which from experiments is found to putrefy more slowly than that which has just circulated through the lungs: analogous to this is the blood of those animals that remain torpid during the winter, and which becomes thereby highly carbonized. "I am assured," says Dr. Maclurg, "that blood drawn from animals which sleep during the winter, while they are in their torpid state, does not coagulate at all And yet all the circumstances of the *vis vitæ*, seem to be present here in excess."* From experiments related in the Annals of Chemistry, it appears that hydrogen gas injected into the jugular vein keeps the blood liquid, and imparts to it an inky blackness.† "It is well known," says Dr. Mitchill, "that hydrogen gas obtained from animal substances, contains a quantity of carbon in solution; so that venous blood owes its dark hue and its disposition to fluidity, to the commixture of a quantity of carburetted hydrogen.‡ This applies more particularly to the venous blood of persons in health, but, as will be hereafter shown, a mixture of alkali with the blood possesses the same property of rendering it dark colored and fluid.

The excessive redundancy of bile, which frequently occurs in endemic fevers, has also been accused both as a result, and likewise a promoting cause of putrefaction; but the truth is, this secretion is a powerful antiseptic, not only

* Maclurg on Human Bile.

† Annales de Chimie. tom. v. p. 266.

‡ Mitchill's Letter to Havens. Tracts on Septon, p. 99.

resisting putrefaction in other substances, but also, of itself remaining longer free from putridity than any other fluid of the body. It is not unusual, at farm houses in the country, to see gall bladders with their contents, which have hung up for months, as remedies of domestic use, free from corruption, and the fluid at length becoming inspissated to a solid consistence, without having undergone any degree of putrefaction. We are not much surprised that the moderns should have embraced an opinion favorable to their hypothesis of diseases, since similar causes led Boerhaave and Senac into error. Even the learned Dr. Haller has quoted from Mr. Gaber an experiment to prove that the bile begins to stink in a cold place, within two hours after death.—Nothing can be more clear than the presumption that the force of imagination and the prejudice of opinion had, in this instance, previously affected the olfactories of Mr. Gaber with an offensive odour, since without the assistance of these powerful auxiliaries it would have been impossible for him to discover it in the bile. Dr. Maclurg, who notices this circumstance, observes, "But when I find that bile taken out of the body, which is yet warm, and bile which has lain in the bladder three or four days after death, have exactly the same properties, and, particularly, are both firmly coagulated by vegetable acids, I am inclined to consider Mr. Gaber's case as somewhat singular."* "The bile," says the same author, in Experiment 36, "had lain, to my knowledge, thirty days in the dead body; and the gall bladder was taken out; there was a very offensive smell in all the abdominal viscera, yet this fluid, being poured into a phial, and closely stopped, acquired a sweet smell, which continued some days before the putrid fœtor began." And we learn from the same experiment, that it had a greater effect than so much water in retarding putrefaction, and making it less offensive.

It is well known that bitters act as antiseptics upon dead animal and vegetable matters; and that the bile, from its bitterness, should possess this property in an eminent degree, is agreeable to the general analogy of nature in other instances; the greater wonder would be, that it should prove otherwise; and nothing but the circumstance of its redundancy in fevers of supposed putridity has given rise to an opinion so erroneous as that of the putrescent quality of the bile.

* Maclurg's Experiments on Human Bile, p. 61.

From all which it would appear that the doctrine of a putrid tendency in the animal body receives no countenance and support from any state and condition of the bile. Since putrefaction is incompatible with life, is it not absurd and unphilosophical to talk of a tendency to an event which, in the nature of things, never did nor ever can happen in the living body? Was ever life destroyed by a tendency to putrefaction? We are told, moreover, that the fluids of old persons are more disposed to putrefy than those of the young; but more accurate observation informs us, that the flesh of young animals is somewhat more prone to putridity than that of old animals:* and it is important to remember that an acrimony of the fluids is very different from a state of putrescency. That the fluids and excretions of the body are more acrimonious in the aged than in young persons, is a physiological truth, confirmed and proved by general observation: such an acrimony, however, has no connexion with, or dependence upon, any putridity or putrid tendency of the system. This subject may, probably, be correctly illustrated, by saying, that the fluids and solids of old persons are more highly animalized than those of the young; hence their acrimony and disagreeable odour; in the same way as takes place in carnivorous animals, whose bodies and fluids, from the exclusive use of animal food, acquire an acrimony and rancidity, similar to that which naturally occurs in advanced life in the human constitution. Hence it probably was, that the flesh of all quadrupeds except those of the ruminating kind, which live exclusively upon vegetable food, was prohibited to the Jews by the Levitical law of the Old Testament: for, inasmuch as the flesh of these beasts is already too highly animalized, the use of it would produce a hurtful excess of this disposition in the human system.

Life is frequently destroyed by fever, and, as before remarked, it may be said that every thing that has a tendency to produce death, has also a tendency, in one sense, to produce putrefaction; for death is the commencement of this process; and whether life has been terminated by a fever, the Samiel blast, a fit of apoplexy, or a fracture of the head, there is an equal tendency to putrefaction; but to say that death is produced by a putrescency of the fluids, is anticipating a change compatible only with death itself.

* Med. Comment. Vol. II. p. 142.

CHAPTER VIII.

PROXIMATE CAUSE OF FEVER.

Of the Proximate Cause of Fever, or the Operation and Effects of the Remote Causes.

Since the external circumstances, hitherto considered, in chapter 1st, derange the animal economy and disorder the health of those who are exposed to them, the question arises, what is their manner of operation in the production of disease? The question is important and interesting, inasmuch as it involves in its consideration the functions of the animal economy, so far as they are concerned in the transition of the system from a state of health to that of disease, together with a knowledge, more or less perfect, of the immediate cause of febrile epidemics.

It is evident that no rational indications of cure can be founded without a knowledge of the proximate cause. If we are, therefore, ignorant of this fundamental and rational guide, our practice must be, in a great measure, the mere quackery of empiricism, without object or design, unsupported by truth, and fundamentally erroneous. By a removal of the proximate cause we cure the disease, and until this cause is removed, our efforts must be unsuccessful. Thus the theory of scurvy, as I have in another work attempted to show, teaches us to consider the proximate cause of this disease as consisting in a morbid alkalescency of the fluids of the body, and our plain and obvious indication is to correct this alkalescency by the use of acids and acescents.

The predisposing causes of fever are such as debilitate, and produce a greater or less disorder in the functions of the animal body; and one of the most frequent and powerful of the exciting causes is cold. The obvious operation of all these morbid and debilitating agents, is the suppression of the perspiration, and provided no other causes have operated on the body but those of the simply depressing and exhausting kinds and the subsequent application of cold, the fever will be a catarrh or synocha. For agreeably to Sanc-

torius, "Whenever nature is disturbed in the business of perspiration, she soon begins to be defective in many more of the animal functions."* When we consider that five eighths of the meats and drinks taken in go off by insensible perspiration,† we may easily imagine that the retention of so great a proportion of the excrementitious matters, even for a short time, must be productive of considerable disorder to the system. It is observed by Hoffman, that nothing tends more to vitiate the bile, render it impure, or load it with caustic salts, than the usual perspiration on the surface of the body being checked: and that such an obstruction takes place in fever, every circumstance leads us to believe. We have previously noticed the arguments in proof of the morbific miasms being received into the system; and remarked, that in many instances their operation is so powerful as to occasion instant death; that when less sudden and violent the symptoms of derangement are protracted for a longer or a shorter time, until the natural and vital functions of the body are again restored.

We have formerly noticed the results of decomposition as consisting principally of ammonia, phosphuretted, sulphuretted, and carburetted hydrogen gases; all of them highly injurious to animal life. The phosphuretted and sulphuretted hydrogen gases, however, from their not remaining long perceptible to the sense of smell are probably not very permanent; but the carburetted hydrogen is constantly disengaged from all decomposing vegetable matter,

*Medicin. Stat. Sec. ii. Aph. xxxv. on Air and Water. As causes of suppressing perspiration, Sanctorius mentions the following circumstances, cold, damp and humid air, swimming in cold water, gross viscid food, and neglect of exercise. (*Aph.* 67) He observes in another place, that cold, windy, or wet air lessens perspiration. (*Aph.* 200.) "Grief," says he, "does intrinsically prevent its discharge, and a foul air especially." (*Affections of the Mind, Aph.* 14.) "They who go to bed with grief perspire thereby less in the night, and the following day their bodies will be found heavier." He further remarks that if through any error, a pound of perspirable matter is detained in one day, nature is generally three days in discharging it. To which his commentator, Quincy, gives the following explanation, after observing that experience confirms the truth of the aphorism, he remarks, "upon taking cold, as it is usually called, which is nothing else than a lessened perspiration, it is seldom less than three days before the inconveniences arising from it are removed; and by that time the body either gets quite rid of them, or is seized with the usual symptoms of an acute fever, of which, unless removed by some evacuation that carries off the overcharge, nobody can see the consequences." Sanctorius elsewhere remarks, that "an obstructed perspiration in summer disposes to malignant fevers; whereas, in winter it makes but small alteration. For bodies are more subject to acrimony or sharpness of the perspirable matter in summer than in the winter season." (*On Air and Water*, Sec. ii. Aph. 35.)

† Sanctor. Sec. i. Aph. 6.

and together with ammonia probably constitutes the chief ingredient of marsh miasmata.

From the striking analogy existing between scurvy and typhus, we have reason to conclude that they are allied in their nature: the poison of the one being more inactive, and more gradually accumulated in the system, gives rise to symptoms of a less acute nature. Between typhus and scurvy, however, the resemblance is striking, and so closely do they approximate in their character and appearance that they are frequently confounded with each other; insomuch as sometimes to render it difficult to decide upon the nature of the epidemic. The plague and scurvy have many symptoms in common, and frequently alternate, or prevail at the same time, more especially in camps, or besieged places.—They both originate where famine, bad provisions, noxious exhalations and filth prevail. The chief difference seems to be, that in scurvy the noxious matter of disease is principally taken in by the stomach with the food, and in the plague from the atmosphere by the lungs. In scurvy, the fluids are manifestly alkaline; and from analogy we infer a similar condition, both in typhus and in endemic fever.* A tendency of this nature is, indeed, observable in all fevers which are of long continuance. It is the natural effect of the suppression of the perspiration and defect of nourish-

* In my treatise on scurvy, I have mentioned the following facts, in illustration and proof of the morbid redundancy of alkali in the fluids of scorbutic patients.

"1st. The urine turns vegetable blue infusions to a green colour: (and we are informed by Johnson, that the blood of a scorbutic patient had an alkaline taste, and changed the syrup of violets green. (*Animal Chemistry*, p. 95.)

2d. The blood is dissolved and more thin and fluid than natural. According to the observations of Lord Anson's surgeons, Messrs. Ettick and Allen, in the dissection of scorbutic subjects, the blood in the veins was so entirely broken, that by cutting any considerable branch the part to which it belonged might be emptied of its black and yellow liquor.

3d. The fleshy or fibrous parts of the body are relaxed, soft and easily lacerated.

4th. The water contained in the thorax and abdomen, found upon dissection, possesses such a high degree of acrimony and causticity, as to excoriate the hands upon coming in contact with it.

5th. The blood of scorbutic patients, by the admixture of lemon juice, becomes somewhat lighter, and on the addition of nitre and vinegar, it becomes of a florid red; the same appearance takes place with nitre and lemon juice. By volatile alkali the coagulum is turned black, and is again rendered florid by the addition of nitre in the juice of lemons and in vinegar.

6th. The exhibition of alkalies produces a scorbutic habit of body.

7th. It is well known that vegetable acids and acescents are the most powerful and infallible antidotes and remedies for scurvy." See *Observations on the Topog. & Diseases of Louisiana*, p. 72.

ment to render all the fluids of the body more highly animalized and acrimonious, and to increase their natural tendency to alkalescency. This is remarkable in those who are starved to death. Now in fever there is a constant wasting of the substance of the body, and defect of nourishment, which are equivalent to starvation in their effects upon the system. In animals starved to death, there is an accumulation of bile in the gall bladder, in the same manner as takes place in bilious fever, and from similar causes, viz. an acrimonious state of the fluids, which it is, in a great degree, the function of the liver to correct and prevent, as far, at least, as is consistent with the limited powers of its operation. It was supposed by Morgagni, that the distention of the gall bladder, observed in cases of starvation, was owing to the empty state of the stomach, freeing the receptacle of the bile from its ordinary compression. This opinion, however, seems to be erroneous; for Haller found both the stomach and the gall bladder full of bile in an animal that had been starved to death.* And another observer has remarked a vomiting of bile, and jaundice among the consequences of privation of food.† It is well known, that in jaundice, the bile, from being obstructed in its natural outlet, is absorbed and diffused through the system, and hence a considerable degree of vitiation and dissolution of the blood must necessarily ensue. Where the jaundice has been of long standing, the body sometimes becomes covered with itching scorbutic eruptions, and hæmorrhages take place from different parts of the body. "In a high degree of jaundice," says Dr. Huxham, "hæmorrhages often burst forth from all parts of the body; as I have frequently seen, and which could not be restrained by any kind of medicines; nay, you no sooner stop the flux in one place than it bursts

* Phys. L. xix. s. 2.

† Fontan. Dissert. Anat. p. 39. Dr. Langrish, in his Modern Theory and Practice of Physic, has related some experiments which go to show the chemical and morbid condition of the blood in inflammatory fever. Having distilled two separate portions of the blood, drawn from people in inflammatory fevers, he found the quantities of volatile salt and oil, which came over in the receiver to be very near double to what they were in the like portion of the blood drawn from persons in perfect health; and in like manner, when he analyzed the urine, he found that as the fever went off, and the saline and earthly particles were in a good measure discharged by this outlet, the quantities of volatile salt and oil which came over in the distillation, were about double the quantity found in the urine made while the fever was going on, and while these irritating matters remained blended with the general mass of the circulating fluids; the urine becoming more and more impregnated with salt and oil, in proportion to the abatement of the heat, and of the other distressing symptoms.

out in another."* "Many years ago," says the same author, "a robust gentleman, who drank hard and indulged much in spirituous liquors, fell into a severe jaundice, from which, however, he would have escaped, if he had regularly conformed to the rules I gave him. But he did not; and because his gums bled, and his teeth were black and foul with scurvy, applied himself to a tooth doctor, forsooth, who, rubbing his teeth and gums strongly, brought on a hæmorrhagy, of which he died in sixteen hours."† Dr. Tissot mentions the case of a patient, who having imperfectly recovered from a bilious fever, with an obstruction of the liver, by afterwards taking soap pills, was affected with anxiety, oppression, jaundice and dropsy, which ended in death, to which he thinks the pills contributed.‡

Analogous to these causes in producing vitiation of the blood, is the action of miasmata received into the mass of circulating fluids, which have a tendency to increase their natural alkalescency. Even the serum of healthy blood contains soda in an uncombined state; and it appears to be owing to the solvent power of this alkali, says Johnson, that the albuminous portion of the blood is preserved in a state of fluidity.§ But this mineral alkali is more especially abundant in the excreted fluids of the body: As we know not what constitutes the difference between soda and ammonia, and as they both agree in their general properties, it is probable that by some slight change effected in the course of the circulation and by the secretory organs, the one may be converted into the other: however this may be, the presumption is, that when abounding in undue proportion they mutually aid the operation of each other in their morbific influence upon the body. During the summer season, in warm and unhealthy climates and situations, the principles of ammonia, nitrogen and hydrogen, are continually received into the lungs by respiration; nitrogen, we have already remarked, forms a permanent portion of the atmosphere, whilst hydrogen is continually extricated from decomposing animal and vegetable substances. And it has been already stated that from the observation of Goodwin and the exper-

* Huxham on Epidemics, Vol. I. p. 191.

† Ibid.

‡ Tissot. Essay on Bilious Fever, p. 22.

§ Chemical analysis discovers the following ingredients in the blood; water, albumen, gelatin, hydro-sulphuret of ammonia, soda, sub-phosphate of iron, phosphate of soda, muriate of soda, phosphate of lime; besides a small portion of benzoic acid, which has been detected by Proust. *Thompson's Chemistry, Vol. II. p.* 662.

iments of Pfaff, nitrogen gas is consumed in considerable quantity in the lungs, and by meeting with the hydrogen of decomposition, received also in respiration, an alkaline compound is formed pernicious and destructive to animal life. We also know that ammonia itself is formed in considerable quantity during the process of decomposition; and, being an aeriform substance, may be received into the circulation from the atmosphere which surrounds us.

As nitrogen constitutes the principal and striking difference of animal from vegetable matter, we see the necessity of this element as an indispensable requisite in the economy of nutrition, in assimilating vegetable food, thus rendering it more animalized, and thereby accomplishing the purposes of nourishment and growth to the body. As vegetable food consists in a redundancy of carbon, which is given off in the lungs, and in a deficiency of nitrogen, which is supplied from the atmosphere in respiration in animals purely herbivorous, and partly from the food in those which feed upon the flesh of animals, as man, we can perceive how these necessary principles of our bodies are adjusted in an atmosphere pure and uncontaminated. But in warm climates and unhealthy seasons there is constant danger of the animal process going too far. To correct, and in some measure to obviate the injurious excess of this tendency are the offices and objects of the various excretions, and more especially the secretion and excretion of bile. This we infer from several considerations, and particularly from the abundant formation of the biliary fluid which takes place in warm climates, and in the hot and unhealthy season of the year.

There appears to be a considerable analogy and dependance between the functions of the lungs and of the liver, and the presumption is, that they mutually assist each other in the purification of the blood. To remedy or prevent the morbific tendency in the system, arising from the want of respiration in the fœtus we find the liver disproportionably large. Fourcroy was of opinion that the blood as it circulates through the mesenteric, splenic, and hepatic arteries, and afterwards into the divisions of the vena portarum, undergoes great changes in its nature; whether as physiologists say, it dissolves and takes with it some of the fat of the abdominal viscera, which is scarcely possible, or rather on traversing these different regions very gradually, the carbon it contains unites with the oxygen, which, as it were, has only been interposed between the molucles of the componeut parts, during the respiration in passing through the lungs; and consequently being a long time in regaining that

viscus, it assumes a fatty character, from the superabundance of hydrogen, which it communicates to the organs it nourishes and supports. It has been said that if this be the effect in man and quadrupeds, whose respiration is so perfect, in the vessels through which the blood circulates with rapidity, it ought to be infinitely more marked in those animals which are able to live a long time in the mud, or most infectious filth, without breathing, and in whom, where respiration does take place, it is only in a very limited and imperfect manner, from the smallness of their respiratory organs, and from the consequent admission of a very small quantity of air, and which cannot be intimately united with the humors for a long time after its reception, from the slowness with which the fluids of such animals circulate through the body. Hence these amphibious animals are more or less soft and cartilaginous, pale and even colourless throughout their composition, have very little sensibility, and are without agility. Fourcroy has drawn these conclusions from the component parts of the bile; from sometimes finding traces of oil from teazing or cutting the human liver, and that of quadrupeds; from the liver of the ray containing more than half its weight of oil perfectly formed; from certain parts of the lower belly, in diseases of the liver, taking on a fatty character, and becoming white, or rather grey, like the liver of the ray; from the livers of flying animals, particularly of birds exposed to a high temperature and fed on milk, taking the same character; and from the size of this viscus in amphibious animals when compared with others, and the liquidity and oiliness of their brain, which may be attributed to a very limited respiration.

Bile, like soap, is decomposed by acids; when agitated in a phial, it forms a lather like soap and water; and its saponaceous property is demonstrated in purposes for which it is employed by scourers, to remove spots of grease from cloth. A considerable portion of the bile consist of mucilage, combined with a bitter resinous principle, soluble in alcohol, together with soda. The combination formed by the addition of vinegar to bile, is a coagulum. This mixture filtered and evaporated, affords a neutral salt, formed by the acid that has been employed, and soda. For this elegant experiment, proving the existence of soda in the bile, chemistry is indebted to M. Cadet. The matter that rests on the filter in this instance is thick, viscid, very bitter, and highly inflammable. This precipitate is a substance similar in its nature to resin. "The action of acids on the bile," says Fourcroy, "shows, therefore, that this substance is a true

soap, formed of an oil, nearly of a resinous nature, in union with soda." The bile combines readily with oils, and takes them up, as well as soap from stuffs. The fluid is entirely dissolved in alcohol; which separates from it the albuminous matter. The tincture of bile is not decomposed by water; which shows this substance to be a true animal soap, equally soluble in aqueous and spirituous menstrua. Æther very readily dissolves it. Vinegar decomposes the bile as well as the mineral acids. The liquor, filtered and evaporated, affords acetate of soda in regular crystals. From these several facts, it follows, says Fourcroy, that the bile is a compound, consisting of a good deal of water, a peculiar aroma, an albuminous mucilage, a particular concresible oil, and carbonate of soda.* Dr. Saunders thinks it doubtful whether the bile really forms one of the constituent parts of the chyle or not. If, however, all or any of the component parts of bile do contribute to chylification, no traces of their presence can be discovered from the sensible properties of the chyle. From the constipation of the bowels which takes place in jaundice, Dr. Saunders considers the bile as a natural cathartic. "It is probable, therefore," says he, "that even admitting the bile to contribute somewhat to the digestion and assimilation of our food, its principal office is that of a natural habitual stimulus to the intestines, keeping up their energy and peristaltic motion." It has been further said, that by virtue of its alkaline nature it corrects acidity, resists fermentation, and by its bitter quality retards the putrefactive process. That it does assist in the assimilation of the food is probable, from the circumstance of the economy, by which it is provided that the bile flows into the duodenum at the time of chylification, thereby correcting any undue acidity which may exist, and by the admixture of its oily and mucilaginous portions assisting the animalization of the chymous mass.

Notwithstanding these various uses and properties of the bile, there is every reason to believe that it is, to a considerable degree, excrementitious, from the considerations hitherto maintained, as well as from the quality of the blood from which it is secreted. We find that all the other secretions of the body take place from arterial blood: whereas the bile is secreted from that which has undergone the last degree of vitiation which it is capable of receiving in the living animal body; after having fulfilled the purposes of nutrition, and contributed to the other secretions of the

* Fourcroy's Chemistry, Vol. II. p. 12–13.

system, and when it is no longer fit for the general purposes of the animal economy, it is returned to the centre, black, grumous, and loaded with impurities. The blood of the vena portæ is, physiologically speaking, in the highest degree animalized, possessing a large portion of carbon and hydrogen, or carburetted hydrogen in a concrete state, together with an undue portion of alkali, or its principles. As the lungs are not adequate to the purification of the blood from the injurious redundancy of these matters, it undergoes a previous and partial purification in the liver, by which such parts as the more delicate function of the lungs is unqualified to eliminate, are separated from the mass of blood; and after having undergone the last degree of purification in the lungs, is again fit for the various purposes of nutrition.

Besides, the liver is too voluminous to admit the supposition that its function is merely that of a secretory organ, seeing it far exceeds the size of any other gland in the body; and in animals of limited respiration, its dimensions are greatly increased, to supply the defect in the function of the lungs. The carbon and hydrogen seem principally to give the dark colour to the venous blood, while its fluidity is derived from the soda. In circulating through the liver, these principles are separated from the blood, and the carbon and hydrogen uniting, form the oily substance, which combining with the alkali, a liquid saponaceous fluid is produced with the characteristic properties of bile. Johnson, speaking of the excrementitious nature of the bile, observes, "Hence arises the necessity of this fluid being made with constancy and regularity, for the integrity of all the functions, and the reason of its existing in all animals, and of its being as necessary as the function of the lungs during respiration. In those animals whose respiratory organs are small in comparison to their bodies, and where the carbon and hydrogen must be in large quantity in their blood for the want of proper evacuation, the liver is remarkably capacious, and the secretion of bile great in proportion, by which means these substances are evacuated, and these animals adapted to their mode of life." It is in this way that these two viscera assist each other. To this circumstance of the bile being in a great degree excrementitious, may be ascribed several other properties, viz: its nauseous and disgusting smell and taste. It appears from the experiments of Fourcroy, that the oily part of the bile is nearly in the state of spermaceti, but preserving its fluidity during a state of health. When, however, this matter is too abundant to remain in solution in the bile, it become crystalized, form-

ing calculi in the gall bladder, which, on analysis, evidently appear to owe their foundation to this oily concrescible matter; which being retained either in the pores or parenchymatous substance of the liver, often proves the source of several of its diseases. Thus, from the most impure blood, and such as many have considered strongly disposed to putrescency, a fluid, the most antiseptic of any in the body, is secreted. What effect the bitterness of the bile may have in resisting the putrefaction of the fœcal residuum in the bowels, we cannot positively say; but we know that the fœces undergo a degree of putrefaction in the large intestines, and it is possible that the bile may check and retard this process. This, however, is not considered as an established fact, unless it should appear that the excrement of a jaundiced patient, where the bile is excluded from the bowels, is more putrid and offensive than that of a person in health.

Whatever has a tendency to increase the excrementitious quality of the fluids beyond the degree consistent with health, must disorder the functions of the system, and predispose to, or produce disease. Such a tendency I conceive to be occasioned by the noxious miasmata generated in warm climates, and during the summer season in more northerly latitudes. As previously remarked, both ammonia and its principles are disengaged from decomposing animal and vegetable matters, and being received into the body increase the alkalescency of the animal fluids. Now, every thing possessing this property must favor the production of that state of the blood which disposes to the increased secretion of bile; and we consequently find, as a characteristic of the fevers of warm climates, that there is always an undue quantity of the biliary secretion. This circumstance was remarked as early as the days of Hippocrates,* and has since been confirmed by the general observation of all experienced physicians.† This substance, however, deviates in disease from the healthy state, not only in quantity, but also in quality and consistence; being exceedingly acrid and alkaline, and frequently of the blackness and consist-

* Hec enim anni tempestas æstas æstuosa est, et corpus bili majis abundat, gravitates etiam lumbos et genua infestant, calores aboriuntur, and venter torminibus torquetur. *De Salub. Victus Ratione.*

† The influence of the season in changing the quantity as well as the quality of the bile, has been observed not only in the human, but also in the brute creation. "I have been assured," says Dr. Ryan Robison, "by a very knowing butcher, that animals have the least bile in January, and most in July." *Robison on the operation of Medicine.*

ence of tar or molasses: evidently showing a great redundancy and excess of the principles which afford it in the mass of blood.

It is remarked by Hippocrates,* that during the summer and autumn, the atrabilis, or black bile, is thick and abundant, as depending on the condition of the blood. And Prosper Alpinus, speaking of the fatal pestilential fevers which raged in Alexandria during the autumnal months, mentions, among others, the following symptoms: On the first day, many were affected with a bilious vomiting, the body was in a continual state of restlessness and agitation, with great oppression at the stomach. In many, the evacuations by stool were liquid and bilious.†

Mitchill, in his account of the yellow fever of Virginia, in 1741 and 42, says, "The gall bladder appeared always of a deep yellow, but was full of black, ropy, coagulated atrabilis, which sort of substance likewise obstructed the porus biliarius and ductus cholidochus. This atrabilis was hardly fluid; but, on opening the gall bladder it retained its form and shape without being evacuated, being of the consistence of thin extract, and with all, glutinous and ropy, like soap when boiling.‡ Dr. Cleghorn, in his account of the diseases of Minorca, relates that he examined the bodies of more than a hundred who had died of tertian fevers, and that he constantly found the gall bladder, as well as the stomach and intestines, overflowing with bilious matter.§ The copious and excessive vomiting of bile in the yellow fever of the West Indies is well described by Hillary‖ and Bisset.¶ Lancissi and Guidili examined the bodies of those who had died of bilious fever, and found the cystic bile black, and sometimes concrete, and much vitiated and altered from its healthy state; and the liver of a brown colour.** Dr. M'Lean in his inquiry, speaking of the redundancy of bile in the fevers of the West Indies, informs us that in almost every dissection he had either seen or heard of, the liver has been found somewhat enlarged and tumid, and the gall bladder commonly distended and full.†† Dr. Davis, in the

* Lib. de Natur. Hom. sec. 14.
† Alpin. de Medicin. Egypt. lib. i. cap. xiv p. 51.
‡ Cox's Phil. Med. Mus. Vol. I. p. 4.
§ Diseases of Minorca p. 165.
‖ Observations on the Diseases of Barbadoes.
¶ Med. Essays and Observations, p 158.
** Beanchi. Histor. hepat. part iii.
†† M'Lean's Inquiry into the nature and causes of the great mortality among the troops of St. Domingo.

fever of Walcheren, remarked, together with an enlargement of the spleen, the diseased state of the liver. "The gall bladder," says he, "was distended with dark viscid bile, and sometimes ulcerated on its inner surface."* Dr. Parish, describing the yellow fever, as it appeared in the hospital of Philadelphia, mentions the black appearance of the bile, and says that the black vomit in the stomach had a greenish cast.† Dr. Mackitrick, in his Inaugural Dissertation, published at Edinburgh in the year 1766, upon the yellow fever of the West Indies, informs us that in some patients who died of it, he found the liver spacelated, the gall bladder full of black bile, and the veins tinged with black fluid blood. Dr. Walker, in his account of the pestilential fever which prevailed in the island of Jamaica, in the years 1793–94 and 95, says, "The gall bladder was distended with thick black bile, of the consistence of tar, and some of the same substance was found in the stomach.‡ Dr. Dancer informs us, that in the yellow fever of Jamaica, he found the liver enlarged and turgid with bile, and of a pale yellow colour.

Dr. Stark, in his inaugural dissertation, mentions the great redundancy of bile in the epidemic of Philadelphia in 1793. "I have seen," says he, "nearly two quarts evacuated in the short space of twenty-four hours."§ The publications of Dr. Physic and Dr. Brown, on the morbid phenomena discovered by dissection in the fever of Philadelphia in 1793, among the diseased appearances of the stomach and intestines, take notice of a black liquor found in these cavities, similar to that which had been discharged by vomiting and purging before death, of the same appearance with that in the gall bladder, and of so acrid a quality as to produce considerable inflammation and swelling in the operetor's hands, which continued some days.‖ Dr. Frost, in his

* Scientific and popular view of the fever of Walcheren, p. 42.

† Cox's Phil. Med. Mus. Vol. III.

‡ Dr. Clark, speaking of the bilious affections to which the inhabitants of the Coromandel coast are subject, observes, that in the warm months it is no uncommon thing to see a patient one hour vomiting abundance of gall, and the next hour taking a ride into the country. But that amongst the new settlers, these bilious diseases are more violent and dangerous, and often terminate in cholera morbus; bilious cholic, with spasmodic affections of the muscles; and in dysentery. These spasmodic affections, attended with vomiting, and described by Dr. Girdlestone, appear to resemble the tetanic emprasthotonus, as described by writers, in affecting principally the muscles which bend the body forwards. *Clark on Long Voyages, p. 80.*

§ Caldwell's Collection of Theses, Vol. II.

‖ Rush's Obvs. and Inq. Vol. III. p. 173. A similar vitiation and redundancy have been discovered in the small pox.—*Chalmers on the Diseases of South Carolina, Vol. I. p.* 133.

account of the yellow fever of Demarara, among the appearances on dissection, notices the following: In some, the gall bladder was found empty, and in a few, it contained a dark green, ropy bile, but was generally distended with a black, thick matter, resembling molasses or tar.*

That the accumulation of bile in persons residing in warm and unhealthy climates and situations, is owing to the state of the fluids, and not to the fever, appears from the following considerations: 1st. In various instances, this accumulation takes place where no fever has existed, and is carried off by a vomiting or purging, leaving the person free from all indisposition. 2d. The fever is often protracted and renewed through winter, but this redundancy of bile, in most cases, at that time, no longer exists.

Some physicians have affected to deny that the yellow colour of the skin in the bilious or yellow fever is produced by bile; and have attempted to account for this appearance on the supposition of the dissolved state of the blood, by which the finer and more attenuated parts of the red globules, are effused and lodged beneath the cuticle; in the same way as the skin after the ecchymosis of a bruise, assumes a yellow tinge. This notion, however, appears to be far fetched and erroneous. For, in the first place, this yellowness often occurs at an early period of the disease, before any dissolution of the blood has taken place; and in which, as I have myself seen the crassamentum of the blood when drawn, was of a firm consistence, and even threw up an inflammatory crust. In no disease is the blood more dissolved than in scurvy, yet the skin, different from what takes place in bilious or yellow fever, never becomes yellow. It is true that petechiæ, when disappearing, leave a yellow tinge where they formerly existed; but this yellowness is only in spots, and is circumscribed and very limited in its extent: whereas, according to the opinion under consideration, instead of purple spots beneath the cuticle, the first symptom of this dissolution of the crasis of the blood should be a general diffused yellowness over the whole surface of the body.

In my treatise on the scurvy, I have pointed out the influence of animal food in the production of this disease, and attempted to show that its morbific operation consisted in changing the fluids of the body from a healthy state, and imparting to them an acrimonious and alkaline quality.—Such is the nature and economy of the human frame, that

* Med. Repos. Vol. XIII p. 253.

the process of animalization is in constant danger of proceeding too far, and of occasioning a morbid excess, unless counteracted by the use of a suitable proportion of vegetable nourishment. In a cold climate and in a healthy atmosphere, this tendency and disposition are less remarkable than in those of an opposite description. In northern latitudes the principal morbid operation of the disproportionate or undue use of animal food, is the production of scurvy, or of a scorbutic habit, with foul breath, spongy gums, blotches, ulcerations, and tumors in different parts of the body. But in warm and unhealthy climates and seasons, the pernicious effects of the undue indulgence in the viands of the table, are more speedily and severely felt. It is true that, as in cold and northern latitudes, they have sometimes occasioned scorbutic affections of the body, but their more usual effect is to produce a predisposition to fevers and fluxes; for when their natural tendency and operation are aided by an unhealthy atmosphere, loaded with miasmatic exhalations, they become doubly injurious to the human constitution.

I have, in a former work, pointed out the analogy between fever and scurvy, and have shown that in many instances they bear a near resemblance to each other. It is there also shown that the undue use of animal food has a principal share in the production of scorbutic disorders.—The same analogy should consequently teach us that the use of meats cannot fail to prove prejudicial wherever the general causes of fever prevail. For it should be remembered that the tendency and operation of animal food, and the unhealthy miasmata of decomposition on the body, though unequal in degree, are still the same: they both abound with the principles of alkali; and it is by this mutual operation, that the two causes prove so injurious to the system: that is, by changing the fluids from a healthy state, and rendering them acrid and alkaline. And we are informed by Dr. Rush, that during the prevalence of the yellow fever in Philadelphia, in 1793, he was subject to profuse night sweats, which were so offensive as to oblige him to draw the bed clothes close to his neck to defend himself from their smell. "They lost their fœter entirely," says he, "upon my leaving off the use of broth, and living entirely upon milk and vegetables.*"

Independent of all reasoning, extensive observation satisfactorily proves, that the free and unrestrained use of animal

* Rush's Inq. and Obs. Vol. III. p. 332.

food in tropical climates, and unhealthy seasons and situations, is extremely prejudicial to health, vitiating the fluids, producing an accumulation of bile, and proving on many occasions, both the predisposing and exciting cause of fever.

The observations made in my treatise on scurvy upon the operation of spirituous liquors as a cause of scorbutic disorders, are equally applicable to the subject of fever. It was there stated that as distilled spirits consist, in a great degree, of hydrogen, one of the elementary principles of alkali, they must consequently favor that vitiation of the blood which disposes to the undue secretion and accumulation of bile. I have remarked on a former occasion,* that there can be no doubt the blood of habitual drunkards abounds with a large proportion of hydrogen, as indicated by the fœter of the breath. It even appears that hydrogen is evolved from the blood of drunkards in a disengaged state, and in such a degree of purity as sometimes to take fire upon the approach of a lighted candle to their breath. The quantity of hydrogen existing in the blood of such persons, the vitiation of the fluids thereby occasioned, and the disposition to the formation of a redundancy of alkali, causes an abundant secretion of black and viscid bile; giving rise to violent vomitings and purgings of this offensive fluid; which commotions are sometimes preceded by headache, delirium and other symptoms of fever. The operation or effect of spirituous liquors upon the blood, is analogous to that of animal food and noxious miasmata; they all produce vitiation of the blood, and give rise to an increased secretion of bile. It is as well, by the vitiation of the fluids, induced by the habitual use of spirituous liquors, as by the chronic debility which they occasion, that they affect the legs with ulcerations; in the same way as from the operation of miasmata in tropical climates and unhealthy countries. It is this same condition of the body and vitiated state of the blood which produce ulcers, that also give occasion to scorbutic affections, to carbuncles and other eruptive disorders, incidental to drunkards, which sometimes take place in aged persons from the natural processes of the animal acrimony and vitiation of the fluids in advanced life. It is by the attenuating effects of spirituous liquors upon the blood, rendering it preternaturally thin and fluid, and also by their debilitating operation upon the smaller vessels that those discharges of blood, which sometimes take place from the stomachs and bowels of intemperate drinkers, are to be as-

* Topography and Diseases of Louisiana.

cribed.* Their effects upon the liver and biliary system resemble those of noxious miasmata in unhealthy climates. Both these causes disorder the function of the liver, and give rise to chronic inflammation and enlargement, both of this organ and the spleen, which frequently end in fatal dropsical affections. The excessive use of spirituous liquors, as they abound with the elementary principles of oil, hydrogen and carbon, disposes to the accumulation of fat in the celular membrane; the adipose matter which is formed, however, from the undue use of ardent spirits, is not of a firm consistence, but of a semi-fluid and oleaginous quality, frequently giving to the countenance a swollen and bloated appearance.

Dr. Fordyce, speaking of malignant fevers, remarks, that in such fevers the blood is dissolved, and sometimes quite ichorous. "The same sort of blood," says he, "is taken from those who have thrown themselves into putrid fevers, by swallowing large quantities of spirits of hartshorn, or who have lived long on putrid food, or who have the true scurvy."†

To produce authority in proof of the dissolution of the blood in malignant fever, the writer conceives to be altogether superfluous; examples may be found in every author who has treated upon the subject of malignant, or as they have been called putrid disorders.‡ These writers represent the blood as being mixed with all the excretions of the body, and on various occasions flowing from the nose, gums, corners of the eyes, bladder, intestines, stomach, and, according to Lind, a bloody serosity exuding from the forehead and armpits. It is the same dissolution of the blood that gives rise to purple spots and blotches on the surface of the body, called petechiæ. macula and vibices, from the effusion of blood beneath the cuticle.

* Two cases, the one of a man, and the other a woman, are mentioned by Dr. Darwin, who, having impaired their constitutions by the intemperate use of spirituous liquors, were seized with a ceasely haemorrhagy from their mouths, and from every part of the skin where they happened to scratch themselves, which continued some days till they died.

† Fordyce on Putrid and Inflammatory Fever, p. 60.

‡ For illustrations on this point, the reader is referred to Huxham on Fever; Shebbeare's Practice of Physic, p. 169; Lind on Seamen, p. 52; Schwenke, Hæmatolog. p 90; Cleghorn, Dis. of Minorca, p. 95; Fordyce on Put. Inflam Fev. p. 60; Walker on Small Pox, p. 109; Hunter on the Dis. of Jamaica, p. 171; Mitchell on the Yellow Fever of Virginia, in 1741; Rush on the Yellow Fever of Philadelphia, in 1793; Med. Inq. and Obs. Vol. III. p. 159, &c.

It may not be improper to notice in this place, the erroneous and gratuitous assumption of Dr. Rush, upon the subject of the dissolution of the blood in malignant fevers. The Doctor remarks, that this dissolved state is a sign of the highest excitement and activity in the sanguiferous system, and that it is owing to the immoderate action of the blood-vessels upon their contents, which "tears and rends it (the blood) to pieces." Such a theory was convenient for the Doctor, in order to establish the necessity and importance of blood letting in such cases; which in his zeal for generalization and unity of diseases, he labored to inculcate the *sine qua non* of medical prescription. But, though in this instance, Dr. Rush, like the immortal Columbus, has the merit, as he had the boldness, of launching forth into a trackless ocean, where, hitherto the glance of imagination had never wandered; yet, unlike that matchless seaman, he wanted chart, compass and probability, to sanction his enterprize, and direct his progress, and finally to conduct him to the achievement of successful and important discoveries. We will just remark, that were the opinion of Dr. Rush correct on this subject, we should always find the greatest dissolution of the blood where there existed the most violent excitement of the heart and arteries, as in pleurisy and other inflammatory diseases; whereas, the reverse of this is always the case, and is rendered sufficiently striking by comparing the blood drawn in inflammatory diseases with that of many malignant fevers.

It would appear from the consideration of what has already been advanced, that by the operation of the remote causes of fever, a change in the condition of the fluids of the body is effected, and that to this change from a healthy to a morbid state, the various symptoms and phenomena of fever are to be ascribed. I am at the same time, however, fully aware that there are many symptoms of fever that cannot be explained without a reference to the brain and nerves; such as pains, spasms, delirium and convulsions: but it is well known that these symptoms may all be produced by a primary operation on the sanguiferous system. We can hardly suppose that an organ of such a delicate structure as the brain, should not feel the effects of any vitiated fluid circulating with increased violence through its substance, rapidly depriving it of its accustomed nourishment and health, and depositing poison instead of a healthy secretion. And we accordingly find that all extraneous and poisonous substances, when injected into, or taken up by the blood-vessels, produce similar effects. Thus the reten-

tion of excrementitious matters in cases of ischuria, has produced every symptom of the most malignant fever, and after death, urine has been found extravasated into the ventricles of the brain.* M. Delile and M. Magendi of Paris, have demonstrated the power which poisons possess in affecting the nervous system, when admitted into the blood-vessels; and have shown that their operation can only be explained upon the principle of their being received into the general circulation, and through this medium acting upon the nervous system. This was illustrated by the following experiments: The thigh of a dog was amputated with the exception of the trunks of the crural vein and artery; the thigh was then pierced with a pointed piece of wood dipped in the upas; in another, a few drops of the upas were enclosed between ligatures, in a section of the intestines divided from the mesentery, and having no other connexion with it, than by a vein and artery. In both cases the poison was carried from the insolated parts into the general circulation by the vessels which remained, and the animals died of tetanus, in the same way, though the effect was not so sudden, as when the poison was applied to the spinal marrow cut transversely.† Experiments to the same purpose have been made by Dr. Wilson Philip and others.

The coma, stupor, and oppression in fever, may be ascribed partly to the direct influence of the morbid condition of the blood itself upon the brain, and partly to its dissolved state, by which serum is effused into the ventricles, producing the symptoms of compression.

Even from the imperfect knowledge which we possess of the animal economy, we have every reason for concluding that the immediate cause of fever exists in the circulating fluids. We know from extensive experience that the nervous system may be violently affected without disordering the functions of the heart and arteries: and independent of experience in disorders, we are led to the same conclusion by physiological knowledge, from which it appears that the heart and arteries are not influenced by causes acting on that portion of the nervous system connected with the voluntary functions. These sympathies, however, are not reciprocal; for universal experience teaches us that in all diseases of the sanguiferous system, the brain and nerves are more or less affected. We see this in the inoculated small

* Fevier. Med. Hist. and Reflect.

† See the Amer. Med. and Philos. Reg. Vol. I. p. 171 & 426. These experiments were made with a view of ascertaining whether there is any direct absorption by the veins, which they render probable.

pox, in that form of fever produced by the retention of urine, in cases where poison has been injected into the blood-vessels, and in fevers generally.

How far physicians have been from arriving at a knowledge of the proximate cause of fever, satisfactorily appears by recurring to the theories of Boerhaave, Hoffman, Cullen, Brown, Darwin, and others. It would be an useless expenditure of time, to examine minutely, all the hypotheses of these respective authors: hypotheses of which the improved state of medical science has since demonstrated the errors and absurdities. I shall, therefore, just glance at a few of the leading features of their systems.

Since the doctrine of Boerhaave of *lentor* and *error loci* of the blood became unfashionable, physicians have almost entirely diverted their attention from the consideration of the fluids, and have searched for the hidden nature of fever among the soft solids of the body. Since the revival of the antiquated doctrine of Hoffman by Cullen, and the innovations of Brown and Darwin, the pretended laws of excitability and irritability, have governed the minds and directed the writings of succeeding physicians.

The doctrine of excitability, as laying the foundation of the proximate cause of fever, has been elaborately discussed by Dr. Wilson Philip, in his work on febrile diseases; but, the degree of confidence and credit which Dr. Philip himself attached to it, may be gathered from the contradiction which he himself gives to it in the Appendix of the above mentioned work. After all his laborious devotion to the theory of Brown, and the great pains he has taken to rectify his errors, he there openly renounces his former hypothesis, and shows himself an avowed advocate of the humoral pathology. Such an avowal, however, is highly creditable to Dr. Wilson Philip, for how few do we find, who, upon conviction, are willing to acknowledge the former errors which misled them, and which they showed a zeal in supporting? What is to be regretted, however, in the work of Dr. Philip, is that he has taken so much unprofitable pains to support a theory so unsubstantial and erroneous. It is quite immaterial under what new aspect and variety of forms this doctrine is pursued; whether of a change in the laws of excitability, or any other derangement of the principle of nervous energy and excitement, they are all equally inconclusive and unsatisfactory. Is not the nature of fever quite as well understood by the doctrine of atony and spasm, according to Dr. Cullen, as by the laws of excitability of Brown, by the change in the laws of excitability, or any other change in

the distribution of the nervous fluid, or the concealed and undiscovered agency of the brain and nerves? Even admitting this change of excitement, excitability, and other nervous derangements in the existence of fever, it is evident that these changes are produced by some more immediate and essential cause acting on the system; and, therefore, cannot be considered as the proximate cause of disease itself.

From what has been previously remarked, I think it will be admitted, that the noxious miasmata, producing fever, are received into the mass of circulating fluids, and there produce the various phenomena of fever. If, with Dr. Cullen, we refer the febrile commotion of the heart and arteries to atony and spasm, and to the *vis medicatrix naturæ*, we involve ourselves in a mist of obscurity and darkness.

It has been already remarked that the noxious miasmata, which give origin to endemic fever, by changing the healthy condition of the blood, and by rendering it preternaturally acrid and alkaline, give occasion to the generation of an increased quantity, and to a redundancy of vitiated and unhealthy bile. Now, one method which nature takes, under these circumstances, to effect a cure, is by exciting a vomiting or purging, or both, of the offending matter; and not unfrequently, a cure is accomplished at the commencement of the disorder by these means. We are hence led to conclude that this abundant secretion of bile is a necessary process of the animal economy to free itself from morbific matter generated in the circulating fluids; and which, if not speedily evacuated in this manner, becomes the cause of serious derangement. It was from observing this excessive redundancy of bile in the summer and autumnal fevers of warm climates, that several physicians have been led to consider the bile as the proximate cause of fever. The reader will perceive, however, that this was taking but a partial and imperfect view of the subject: for this redundancy of bile implies some deviation from the healthy state of the system, as the immediate cause of this inordinate and morbid secretion. Besides, it would be contrary to all known laws of the animal economy to suppose that nature should so deviate from her course as to occasion this accumulation of bile for no other purpose than to prove the occasion of disease, or to constitute the proximate cause of fever. If alarming consequences sometimes arise from the vomiting and purging of bile, as in the cholera morbus, this only shows that nature, when excited into action for her own health and preservation, may sometimes proceed to dangerous excess. Moreover, she merely adopts, in

such cases, the very same means that would have been employed by art, to effect the expulsion of the morbid cause. An accumulation of water in the thorax or abdomen not unfrequently proves fatal, yet no physician would show such an ignorance of pathology as to consider this accumulation as the proximate cause of dropsy; mistaking a symptom for the disease itself. The analogy is strictly applicable to the subject under discussion; and as well might it be contended that an immoderate secretion and flow of urine is the proximate cause of diabetes, as that an inordinate secretion of bile is the proximate cause of bilious fever.

Much of the morbific matter circulating in the fluids is undoubtedly eliminated from the general circulation by the biliary organs, and discharged by the way of the stomach and bowels. It is the business and function of the liver to free the system from excess of gross, alkaline and acrimonious matters, and as there is a particular determination of such morbid matters to the liver, it is very possible that, at the commencement of indisposition, the materials of fever may be so far evacuated, by the exhibition of an emetic or cathartic, or both, as to put a stop to the progress of the disorder, and kill the disease in the very germ of its origin. This effect I have frequently observed from the employment of the remedies above mentioned; and all persons conversant with fevers have probably made the same observation. In my treatise on scurvy, I have illustrated the affinity of that disease to idiopathic fever by the following facts.

"Both scurvy and fever often arise under similar circumstances of weather, climate, situation, &c.; as in low, damp, marshy places, rainy seasons, bad air, and from miasmatic exhalations.

"A febrile state is also sometimes attendant upon scurvy. Dr. Lind informs us, that some of his patients had a feverish pulse, and complained of head-ache and thirst; and that *a tertian or quartan ague*, with perfect intermissions, *sometimes accompanies this disease.** I have also noticed the same occurrence. Dr. William Brown, in a letter to Dr. Guthrie, of St. Petersburgh, giving an account of the scurvy which prevailed in Russia, in the year 1787, states, that the force of the heart and arteries seemed, in many cases, to be increased, if we may judge from the state of the pulse, which, frequently, on the patient's first arriving at the hospital, was full and hard. Even in some cases, when, during

* Lind on Scurvy, p. 506.

the whole course of the disease, the pulse had been in a natural state, in most respects; yet, a few days before death it attained a wonderful degree of force. An increased degree of heat was also observed.*

"Dr. Lind says, that in the course of the year 1746, several of his scorbutic patients were feverish in the beginning of the distemper.† In Lord Anson's voyage, it is related that this malady was accompanied with other dangerous symptoms, besides those strictly scorbutic, particularly putrid fevers, pleurisies, jaundice, &c. Burserius distinguishes a fever which he calls *scorbutic tertian*, on account of the symptoms of scurvy manifested by it.‡ Ettmuller also makes mention of a scorbutic tertian, and has been followed by Sauvages. That mentioned by Ettmuller could be cured by antiscorbutics only, or chiefly; seldom yielding to bark.§ Morand likewise takes notice of a similar disease; with this difference, however, that it was immediately stopped by the bark. Dr. Alibert observes, that, in the climate of Middlebourg, the malignant intermittent is oftentimes united with the scurvy; and that this complication is known from the fœtor, the flaccidity, and the erosion of the gums, the deep color of the urine, the blotches on the skin, &c. In the treatment of it, the bark is advantageously joined with acids.‖ Sinopeus acquaints us with a similar coincidence: "Although the scurvy," says he, "was a distemper bad enough of itself, it was, however, often rendered worse by being complicated with other intercurrent diseases, viz. fevers and rheumatism, but especially the intermitting fever."¶ Dr. Lind, speaking of the scurvy in Hampshire, says, such as died of fevers had their legs, several days before death, covered with scorbutic small spots, of a purple, red, or black colour.** The same author observes, in another place, that a fever appeared on board the Edgar, in a few months acquiring great vigor, which, together with a supervening scurvy, destroyed sixty of her crew.†† Bisset, in a treatise on scurvy, states, that the bilious fever of the West Indies often attacks such as are highly predisposed to scurvy, as also those who are re-

* Dunc. Med. Comment. Vol. XII. p. 342.
† Lind on Scurvy, p. 107.
‡ Burser. Instit. of the Prac. of Medicine, Vol. I. p. 344.
§ Ettmul. Opr. tom. ii. p. 324, & seq. Colleg. Practic. sec. xv. cap. 2.
‖ Alibert on Malig. Intermit. p. 257.
¶ Parerga Medica Conscripta, quoted by Lind, p. 405.
** Lind on Scurvy, p. 274.
†† Lind on Fever and Infection, p. 3.

covering from it; in both cases proving very fatal. And Rouppe mentions a man who died of yellow fever and scurvy, in the island of Curracoa. Dr. Blane observes, that in the ship Alcides, while on a cruise in rainy weather, which increased the number of sick, those men chiefly were attacked with fever, who were ill of the scurvy.*

"Hæmorrhages from the gums and other parts of the body are common in the more aggravated stages of scurvy; so are they also in the more malignant forms of fever.

"Dr. Thomas Clark, on the subject of the yellow fever, remarks, that in violent cases, the gums, towards the end of the second day are often sensibly swelled, and of a deep red colour, resembling what takes place in scurvy, and soon after blood is effused from them in very considerable quantity."†

Such is the analogy between scurvy and fever; and on a previous occasion, I conceive, I have satisfactorily proved, that the proximate cause of the former consists in a redundancy of alkali in the mass of circulating fluids. In fever, this condition is less striking; yet judging from analogy and other circumstances of fever itself, I am induced to believe that in the latter a similar condition of the animal fluids also exists.

The various experiments made by Smith, Morveau and others, have, I conceive, established the efficacy of acid gases in destroying infection or the matter of fever. To these considerations in favor of the alkaline quality of the fluids in fever, may be added the great utility of the acids in its treatment, and the importance of fruits of an acid quality in their prevention, as also, the fact mentioned by Dr. Mauduit, that the matter which flowed from the buboes of patients laboring under the plague, changed vegetable blue colours like ammonia.‡ We are also informed by Dr. Arthaud, that upon dissection of a person who had died of yellow fever, the urine changed the tincture of radishes to a green color;§ thus unequivocally demonstrating the presence of alkali in an uncombined state.

As diseases arising from the same causes assume different symptoms, yet partake of the same nature, and require similar indications of cure, it is evident that any division and arrangement, founded on the mere analogy or diversity of

* Blane on the Dis. of Seamen, p. 57.

† On the Nature and Cure of Fever, p. 201.

‡ Experiments instituted to determine the Nature of Pestilential Virus, &c. Journal de Physique, p. 120.

§ Rosier's Journal for January, 1790, Vol. XXX. p. 380.

symptoms, cannot contribute either to the knowledge of their nature, or to the improvement of their treatment.—Gregory, Home, Whytt, Huxham, Fordyce. Brocklesby and others, recommend and adopt the division of diseases according to the causes and method of treatment: an arrangement unquestionably the most natural and unexceptionable.

Perhaps it may be objected that, admitting the causes of fever to act immediately upon the heart and arteries, why is it observed that the nervous system appears generally to be primarily affected? To this it may be answered, that it is only from affections of the brain and nerves, occasioned by the disordered condition of the vascular system, that we are made sensible of any derangement in the phenomena of health. The action of the heart and arteries may be highly excited by exercise without inconvenience or derangement to the functions of health: but let any of the customary secretions be only for a short time suspended, and the consequences immediately show themselves in morbid affections of the whole animal economy. In the latter case, the retention of excrementitious matters renders the blood preternaturally stimulating, and consequently excites the heart and arteries to greater frequency and strength of action. In the case of exercise, the blood being propelled to the heart in greater quantity, and with more rapidity, from the contraction of the muscles, produces a temporary excitement, as in the cases of suppressed perspiration, which abates with the cessation of the exercise that gave rise to it. Now supposing that a preternatural portion of irritability, or in the Brunonean phraseology, of excitability, is transferred to the blood vessels, this state of being more easily excited by the same agent, the circulating fluids, will be equivalent to an increase in the quantity or acrimony of the blood itself: but as there can be no proof of such a transfer of excitability from any known operations of the animal economy, we of course are bound to reject the supposition, as unfounded, and to consider the efficient cause of fever as existing in the circulating fluids. The quality of excitability is to be excited; but it often happens in malignant fever, in different patients laboring under the same epidemic, that the action of the heart and arteries in one is below the natural and healthy standard; and in another, the vascular action is highly excited: according to the doctrine of excitability here would be a difference in the proximate cause of the same disease; for if it be contended that the excess of excitability has been destroyed by the violence of the stimuli applied, I would ask, according to the Brunonean doc-

trine, what stimuli? The natural stimuli of the body are various objects that act upon the senses and sensorium commune, food, drink, and exercise; but when none of these causes have been suffered to act upon the body to any injurious extent, or when they have been applied to two patients equally, how shall we account for the violent arterial action in the one patient, and for the languor and debility in the other? But it should be considered by the advocates of the Cullenian and Brunonean systems, that there are other important stimuli of the body which, in the investigation of the phenomena of diseases they have almost entirely overlooked and neglected; these are the various contents of the vascular system, and of the different organs and viscera of the body. Thus the food is the natural stimulus of the stomach and intestines, the urine of the ureters and bladder, the blood of the heart and blood vessels, &c. By referring the phenomena of fever to the morbid condition of the fluids, the difficulties and beggings of postulata are removed: for according to this doctrine it will be readily understood that in one case the stimulating quality and acrimony of the blood may be such as to excite the sanguiferous system into violent action, and in another this morbid power may be so great as to destroy or overpower the vigor, tone and strength of resistance in the arterial fibre: this is often observed in cases of animal, mineral and vegetable poisons; from the presence and operation of which, the pulse is rendered slow and languid, in the same manner as takes place in malignant and pestilential fevers. Though we know not by what secret peculiarity and agency it is, that the vessels of each gland and function of the body separate the particular fluids which their various purposes assign them; though from any thing which the eye of the nicest, most expert and delicate anatomist can discover, the structure of the kidneys is as well adapted to the secretion of the pancreatic fluid as that of the pancreas itself; yet we know that such a peculiarity of glandular structure and appetency exists. But their various adaptation of the different glands and organs of the body to the performance of their particular functions, it would appear, exists only in relation to their natural stimuli and contents. Let any unnatural or unaccustomed stimulus be applied to them, and they are thrown into preternatural and disordered action. Thus a small quantity of spirituous liquor will produce intoxication or high excitement in a person unaccustomed to its use, whereas on an habitual dram drinker it would have little effect: thus, too, the blood in its purest state of assimilation is the natural stimulus of the

sanguiferous system, but let any other, even the blandest fluid, be injected into the blood vessels, even in minute quantity, and death or violent derangement is the consequence: the urine is the natural stimulus of the urinary organs; but should a minute portion of gonorrhœal virus, though possessing less sensible activity than the urine, come in contact with the urethra, violent inflammation would speedily ensue. So with respect to the heart and arteries, the miasms of fever act as an extraneous and unnatural stimulus, which none of the various glands and organs of the body have hitherto been accustomed to separate and secern from the general mass of circulating fluids.

From observing the symptoms which take place in intermitting fever, we know that the brain and nerves are materially affected at the commencement of the paroxysm. But it has been shown that various substances injected into the blood vessels, also affect the nervous system. Such nervous symptoms, therefore, can afford no argument that the essential and immediate cause of fever does not exist in the blood vessels, and through them communicating its effects to the brain and nerves. In intermitting fever, the morbific matter is in one of the mildest states capable of producing disease in the general system; but between this and the most aggravated and deleterious properties of the *materies morbi* there are various gradations and degrees. In some cases, the operation of the febrile cause is so sudden and violent as to produce immediate death. Instances of this nature have been previously noticed. The immediate effect of the operation of infection, when the cause is strong, is nausea, or a disagreeable sensation at the stomach, an unpleasant taste in the mouth, vertigo, or giddiness, more or less shivering, and sometimes a sense of suffocation. When the operation is more violent, the person is seized with delirium, or raving madness, or becomes stupid or apoplectic, and falls upon the ground. This sudden affection appears to depend upon the immediate operation of the infection upon the nervous system; and a longer or shorter time is afterwards required for the production of fever.

The cold, or chilly fit of fever seems to be occasioned by an unnatural impression on the nervous system, from the irritation of the morbific matters, in much the same way as irritation from other causes sometimes produces the same effect. Thus, the irritation of a stone in the bladder, the introduction of a catheter, strangulated herina, the pain of hæmorrhoidal affections, calculi in the gall bladder, the introduction of a strong enema into the rectum and the for-

mation of an abscess, have all been the occasion of rigors, resembling the cold or shuddering stage of fever. From a general affection of the nervous system, there is at the commencement of a paroxysm of fever and ague, and often, also, in the bilious remitting or yellow fever, a horripilatio, and a shrinking and coldness of the extremities and of the surface of the body, the smaller vessels are constricted and rendered impervious, and the weight of the circulating fluids is thrown upon the heart and larger vessels. This accumulation of blood in the central arteries naturally excites them into increased and preternatural action, which is still further increased by the vitiated and irritating condition of the circulating fluids. This increased action of the heart and larger arteries at length overcomes the debility, inaction and torpor of the smaller vessels, upon which a general perspiration taking place, the laboring vessels are relieved from the irritating matter which stimulated them into preternatural action. In this manner an intermission is effected; for when the morbid matter is so far evacuated that the remainder is no longer capable of supporting a febrile action, the symptoms of fever disappear. But as part of the morbid matter is still left lurking in the vessels, from the power which it possesses of assimilating a portion of the fluids to its own nature, the febrile symptoms, at times, again recur, and go through their various stages as before. Now to prevent this recurrence, one of two things is necessary, either the total expulsion of the morbific matter, or else a state of insensibility to its action, produced by such remedies as increase the tone and vigor of the system, or diminish its irritability, as the exhibition of narcotics. When the healthy functions of the animal economy are by these means restored, the materials of disease are eliminated by the natural excretions. On many occasions, the morbid poison is so virulent, that after producing symptoms of high excitement for a short time, instead of effecting its own expulsion, either in whole or in part, as in intermittent fever, and establishing convalescence, it occasions prostration and collapse; in which the febrile symptoms, beat and high arterial action, indeed, subside; but they subside because the power of the heart and arteries is exhausted, and can no longer be excited into vigorous action.

In most other fevers, besides the intermitting, the affection of the nervous system at the commencement of the disorder is much less regular and certain; and although in many instances of the bilious remitting fevers of warm and tropical climates, some degree of chilliness is perceived to

usher in the paroxysms, yet in many others, and those of the most malignant character, no sensation of this kind is manifest, either to the patient himself or to his nurses and attendants: so that the sensation of chilliness, the rigors, and the shrinking of the surface, form not an essential or necessary part in the phenomena of fever. In many and the worst cases of fever, the order of an intermittent paroxysm is not observed; simple excitement of the blood vessels, with little or no nervous affection, takes place, and the various nervous symptoms which subsequently ensue, as coma, delirium, convulsions, &c. all refer themselves to the morbid condition of the circulating fluids. Dr. Cullen considered the paroxysm of an intermittent the natural, regular, and more perfect order of idiopathic fever; and endeavored to account for the successive stages on the supposition of *sedative powers, atony* and *spasm*, and the *vis medicatrix naturæ*. But as the coldness and shrinking of the surface of the body, only mark the milder grade of the disease, there, consequently, is no necessary connexion between this and the other symptoms of fever; and one link, in the Doctor's chain of causation, being broken, leaves it, as it is, unsupported and imperfect.

The symptoms of fever will, at different times, be variously modified, by the different state of the moving powers, and of the muscular and irritable fibre: but it should at the same time be recollected that the health, soundness, and freedom of action in the animal machine, depend primarily upon the purity of the circulating fluids. If these are corrupted, the whole economy soon becomes disordered; but should the morbid poison introduced be too powerful for the strength and tone of the vascular system, the powers of life become suddenly prostrated, and the system sinks without the possibility of reaction. If the poison is strong, this stage of increased action will be of short continuance, and that of typhus, or of prostration and collapse, will speedily ensue: should the febrile matter be less powerful, the symptoms of vascular excitement will be more fully developed and longer protracted. When the cause is still less virulent, the inflammatory symptoms will be variously protracted, according to the constitution of the patient and the state of the muscular fibre.

A further explanation of this subject will be found under the head of the *Operation of the Remedies employed in Intermitting Fever*, as also those of *Prevention* and *Cure*.

CHAPTER IX.

OF THE SYMPTOMS OF FEVER.

The symptoms as here detailed, though suited in a considerable degree to the endemic fever of the southern states in general, are more especially characteristic of the fevers of Louisiana and Florida: the fevers of Alabama will be more distinctly treated of hereafter.

The attack of this disease is somewhat diversified, according to season, constitution, &c.; being sometimes more sudden, at others more slow and gradual in its invasion.—When the exciting cause has been strong and long continued, the disease comes on suddenly and proceeds rapidly to the height of febrile exacerbation. Generally, however, the patient is admonished of the threatened attack by various premonitory symptoms fluctuating between health and disease. For the first twelve or twenty-four hours, he is affected with listlessness, want of energy and disinclination to motion; and exertion of every kind becomes laborious and irksome. There is frequently a disagreeable or bitter taste in the mouth, a want of appetite, a degree of nausea, though the patient often flatters himself that there is nothing serious in his indisposition. Upon sitting down to his customary meals, he feels more sensibly his deviation from health; at such times the sight and smell of animal food become unpleasant and disgusting; and he rises from the table with an aggravation of the symptoms. The sensation of languor and lassitude increases to a degree of anxiety and uneasiness; perception is impaired, the mind is fatigued with the slightest attention, and exercise is difficult and painful. An uneasy sense of stiffness is perceived in the motion of the eyes, a degree of tension is felt across the orbit, and a dull, heavy pain in the head. The joints feel stiff and fatigued, as if the person had just performed a wearisome march; an uneasy sensation takes place in the small of the back, and a soreness affects the muscles of the legs; the animal functions are debilitated, and great anxiety at times pervades the system. The countenance, when examined at this early period of the disease, exhibits a devia-

tion from health, the features are dejecting and desponding, the complexion sallow, the eyes dull and heavy. For a short time the patient seems to stand tottering upon the isthmus between health and disease, flattering himself that his indisposition is slight, and that in the course of a day or two, health will return without the interference of medical aid. At times, he thinks his disorder imaginary, and endeavors to partake in the passing amusements; he, however, soon finds himself fatigued, and so much indisposed as to be under the necessity of going to bed. If he is a person addicted to the use of spirituous liquors, he endeavors to dispel his languor by having recourse to his accustomed stimulus, which is but adding fuel to the dormant spark. In the meantime, the disease has only been slumbering; the insidious enemy gathers strength by delay, and at length makes a sudden and violent attack upon the vital functions.

The disease is not unfrequently more sudden in its attack, and more rapid in its progress. In both, the febrile affection is often, though by no means always, ushered in with more or less chill, or slight sensation of chilliness and diminution of the natural temperature, slight flushes of heat, alternating with transient, or more protracted chills and unequal distribution of the vital action—pain in the back, limbs and head—small, frequent, contracted, sometimes irregular pulse—anxiety—nausea—sighing and impeded respiration. The nausea and sicknes increases, and vomiting often ensues; the contents of the stomach are at first thrown up; and generally a quantity of yellow or dark coloured bile, by the subsequent efforts of vomiting: sometimes a distressing retching takes place after the bile is thoroughly evacuated, by which nothing but a viscid mucus is discharged. Notwithstanding the stomach is entirely empty, the straining and efforts to vomit are almost incessant; and such is the irritability of this organ, that medicines and substances taken for its relief, frequently increase the disorder. It sometimes happens that this vomiting continues with unabated violence till the final extinction of life: the patient is harassed, and at length, exhausted by the violence of the straining, becomes insensible, and lies in a state of comatose stupor; he is affected with difficult stertorous breathing, gasps for breath, and mutters indistinctly; the extremities and surface of the body become cold; the pulse frequent, weak and trembling; a cold slimy sweat stands in drops upon his forehead, and bedews the surface of the body; the low delirium continues; the vomiting of discoloured greenish, olive, or brownish matter ceases; the pulse becomes

feeble, frequent and scarcely perceptible, faulters and intermits, and an expiring gasp closes the scene : and thus the patient is sometimes carried off at an early stage of the disorder. Should not this excessive vomiting and the state of depression connected with it terminate fatally, an alarming degree of coldness is apt to ensue, from which the patient is with difficulty recovered.

When the attack is less severe, as is more frequently the case, the pain in the back and limbs diminishes, and is succeeded by a violent pain in the head, with a sense of tension, fullness and throbbing over the eyebrows, and in the temples. The circulation is accelerated; the heart and arteries beat violently; the pulse is frequent, strong and bounding, or hard, wiery and contracted; the surface of the body is red, inflamed, sometimes sore to the touch, and is dry, hot and parched; the respiration is short, frequent, anxious and laborious; the patient gasps for breath, appearing evidently in danger, and in the act of suffocation. The tongue, mouth and fauces are robbed of their natural moisture, and partake of the general dryness and aridity of the surface. The thirst is great and insatiable, but the stomach is easily oppressed with liquids, and frequently rejects the drink that has been swallowed. In more favorable cases, this hot stage, after continuing for a longer or shorter time, is succeeded by the sweating stage, during which the sweat flows freely from every part of the body; and is succeeded in the morning by an abatement of the violence, and a remission of all the symptoms. In other cases, the fever continues with little abatement of its severity; a slight perspiration is, perhaps, perceived about the forehead, and on the superior parts of the body; or the perspiration, though considerable, has not been effectual in procuring a corresponding remission of the symptoms.

In the progress of the disease, deafness sometime supervenes, and the colour of the tongue, from being white, assumes the successive shades of yellow, olive, purple, and finally becomes perfectly black.

Where there has been no evident crisis, or perspiration, but the symptoms of excitement have continued with little or no abatement or remission, the febrile action subsides after a longer or shorter time; the skin remaining dry, but becoming shrunk, constricted and cool; the tongue is moist, and either clean, or covered with a brown or sooty fur; the pulse from being full and strong, or hard and resisting, becomes soft, frequent, and sometimes irregular; scurfy and angry, or dark and livid eruptions make their appearance

about the angles of the mouth; a yellowness sometimes appears upon the surface of the body; the adnata of the eyes assumes a jaundice tinge, and a cadaverous sallowness or olive hue overspreads the countenance; the eyes are inanimate, watery, and red; the features dejected, the nose sharpened, the patient deranged or comatose. This state marks the period of collapse. The situation of the patient is not yet hopeless; but the remaining stregth requires to be economized with the greatest care: though the pulse may possess a considerable degree of strength and fulness, the extraction of a few ounces of blood, or the exhibition of an active cathartic might prove speedily fatal. Mild aperients, as cream of tartar, mindererus spirit, the effervescing draught, composed of the carbonate of soda and lime juice, injections, and the occasional exhibition of a little wine, gruel or arrow root, are all that are admissible. When the case terminates favorably, the patient, in a few days, gradually emerges from this state of prostration; the pulse again acquires strength and steadiness; the fever rises and falls several times, perhaps, in the course of the twenty-four hours, and stimulants are no longer necessary or proper, except during the remission, or when the fever comes to a distinct intermission, when a little wine may be given with the bark either in substance or decoction, according as the stomach can bear it. When the disease terminates fatally, in many cases, the yellowness increases, and every part of the body at length exhibits a deep saffron dye, sometimes interspersed with livid or purple petechiæ, and extensive ecchymoses, in the form of streaks and blotches. A yellowness sometimes attends a favorable crisis in severe cases. When the patient groans and mutters to himself, and answers indistinctly, whilst at the same time the eye appears dull, languid, watery, blood-shot, vacant and staring, death may be considered as not far distant. Towards the fatal termination, the sensibility of the eye diminishes, and the patient lies with them half closed, in a comatose state of insensibility. The cornea loses its brilliancy, from the want of moisture, and from the failure of the circulation in its vessels, and appears dim, shrunk and wrinkled. Life, for a time, seems to vanish, again the pulse becomes perceptible. Sometimes the patient is sensible of his approaching fate; and even where the faith of religion is wanting, with a degrèe of philosophical composure, bordering on stoicism, he meets death with indifference, and with real or apparent resignation.

In some instances, towards the fatal close of this disease, the absence of fever, and the coldness of the body, to those

unacquainted with the disorder, afford a deceitful prognosis. The patient when spoken to, says he is better, being unconscious of pain or distress, and the attendants are flattered with the delusive hope of his recovery; a few hours convince them of their error; the patient occasionally discharges from his stomach, by eructation scarcely amounting to vomiting, a dark coffee colored fluid, or greenish black, mixed with dark grumous, or flaky matter; the pulse becomes weak, small and intermitting; the extremities cold—black discharges, sometimes consisting almost entirely of unmixed blood from the ruptured extremities of the vessels, take place without the patients consciousness; the insensibility increases, and life imperceptibly vanishes, or a violent convulsion closes the scene.

The disease when lighter in degree, as it generally is with the natives, and those who for some years have been accustomed to the climate, frequently assumes the form of a double tertian, with similar paroxysms on alternate days; the lighter paroxysm comes on, perhaps, in the morning, and remits in the evening; the other, or more considerable paroxysm, comes on in the evening, and affords but little remission till the next morning. In this particular, however, there is great variety, the accession sometimes anticipating, and at others postponing. The patient is scarcely ever entirely free from fever, and the paroxysms are frequently very severe. Sometimes after an imperfect remission it attacks with the symptoms of a distinct intermittent. The patient is seized with rigors increasing to a violent degree of cold shivering, severe pains in the limbs, and sickness at the stomach; towards the decline of the cold stage, a violent vomiting comes on, and often proves very distressing. More frequently, however, in this form of the disease, after an imperfect remission, the paroxysm is renewed with a slight chill, succeeded by a vomiting of mucous and bilious matter; the hot stage runs high; the pulse is frequent, strong and full; there is a great determination to the head, the arteries of which beat violently, and the pain of which is severe; great anxiety prevails; the patient tosses his body about in different positions, unable to find relief in any situation; a distressing heat pervades the surface of the body, and the mouth is dry and parched; an insatiable thirst prevails, the patient drinks incessantly, and frequently the stomach, from its irritability, rejects the fluids taken in, more especially when the drink is swallowed in any considerable quantity at a time. A clammy viscid saliva collects in the mouth, and obliges the patient to keep constant-

ly spitting. The remission in this form of the disease is seldom sufficient to permit the patient to leave his bed.—The tongue at length, becomes covered with a moist thick, purple, or blackish fur; the body is greatly emaciated, and the general debility extreme. The patient is, in this way, sometimes worn out by the repetition of the paroxysms, or carried off at an earlier period by their violence. This form of the complaint is very apt to prove obstinate and tedious. The body sometimes turns yellow.

There is a form of this disease attended with some variety, with which strangers to the climate are affected. The patient is first attacked with pain in the head and back; the pulse is frequent and strong, and the tongue white and furred; the pulse, though increased in frequency, is often small and tense. Evident remissions and exacerbations take place at intervals; the exacerbations are particularly severe in the evening. The skin is withered, dry, parched, and constricted; a general pain and distress pervades the body; the tongue is either covered slightly with a white fur, or clean, red and moist, without the appearance of papillæ; the taste is vitiated or destroyed; a degree of anxiety and oppression is felt at the precordia; but the nausea is not, perhaps, distressing, nor is the vomiting frequent or considerable; the hearing becomes obtuse; the intellect deranged: delirium takes place, or the patient is affected with stupor or coma; the urine is secreted in small quantity; the bowels are constipated, and all the secretions are in a greater or less degree suppressed; as the disease advances, the tongue assumes a brownish or blackish colour; sometimes the blackness extends in two parallel lines, about the width of the finger, on each side of the tongue. The pulse becomes more frequent, tense and receding; the countenance sallow, withered and inexpressive; the eye watery and languid, or red and wild in its appearance.—Yellowness does not always appear upon the body, nor is it essentially connected as a symptom of the disease: in many cases of fatal termination, it is entirely absent, and it frequently appears in others of a favorable aspect; in either case, the yellowness is not generally perceptible till the febrile action has in some degree abated.

To be more particular, it will not be improper to notice the more erratic and less ordinary symptoms, and such as have not fallen within the scope of the preceding catalogue.

In the bilious fever, in its most agravated state, as it occurs in summer, we frequently meet with an irregular and intermitting pulse, somesimes moderately soft and full; at

others, the artery upon the application of the finger, is tense and wiery, and upon being pressed upon the tendons of the wrist, conveys a peculiar sensation, of which I can give no better idea than by comparing it to the feel of sand mixed with the blood, and gliding through the artery in a sort of hurried, rough, jerking and irregular manner; the pulse sometimes intermitting every fourth or sixth beat, for the space of two or three pulsations. In this intermitting pulse, there appears to be in some instances, a local affection of the vital organs, as the heart or lungs, with a considerable determination to particular parts, which become impeded and obstructed in their functions. This state of the pulse, though observed chiefly in the more aggravated forms of fever, is not always fatal.

In some, there is a violent pulsation in the head, accompanied with a pain darting from temple to temple, or from the forehead to the occiput, and is sometimes particularly distressing whenever the patient lays himself in a horizontal position. I have known these symptoms connected with a general paralytic affection of the whole body, which disappeared as the symptoms approached a more regular form, in the full developement of a febrile character. Sometimes the tongue becomes red, smooth, dry, hard and stiff, as if seared with a hot iron, without the appearance of papillæ, seeming evidently shrivelled and contracted in its dimensions, and it is with pain and difficulty that it is protruded from the mouth. This appearance, as far as I have been able to ascertain, denotes great derangement of the internal viscera, inflammation of the stamach, or engorgement of the lungs, and is connected with a constricted state of the skin; the patient experiences great anxiety and restlessness, with sickness and oppression of the stomach. In some cases, large round worms are brought away by vomiting, with but little straining. In others, the tongue is covered with a slimy and greenish yellow fur, whilst bilious and bloody matter is passed by stool; this state is attended with much prostration of the system; the patient experiences great misery and general distress, with severe pain in the head; the eyes are red and dull, sometimes squinting, and filled with whitish purulent matter. Some are affected with stranguary and suppression of urine, which continue through the hot stage. A fulness and sense of distention of the forehead, as if the head were inflated, are sometimes complained of. At various times during the remission of the fever, the morbific cause seems suddenly to translate itself to the bowels, producing excruciating pains in the lower

part of the abdomen, with much griping and scanty evacuations of bilious, watery, mucous and bloody matter, sometimes variously mixed and blended. In some instances, the patients are seized with hysterical and hypochondriacal affections. These are most apt to take place when there have been much preceding suffering and exhaustion of the strength and powers of the nervous system. In these cases, the patient will give vent to his inexpressible distress in loud screaming, then again he becomes silent, stupid, and comatose; if spoken to, he answers short and in monosyllables, or continues talking with delirious rant and incoherency.

It is not very unusual to observe a patient affected with the greatest degree of alarm, despondency and apprehension; tortured with all the visionary phantoms and horrible apparitions of a distempered imagination; sometimes fancying himself dead, strangely metamorphosed, or about to be devoured by some horrid monster, which haunts his bed in a threatening attitude, and the most terrific form. It is in vain to attempt to arouse him from his melancholy gloom, or to fortify his mind against the objects of his alarm and apprehension.

In some, the surface of the body is extremely tender, sore and painful.

But the most malignant fevers are not always those of the summer season. The worst bilious cases I have ever seen, have happened in the months of November and December. In such cases, the symptoms vary considerably from those of the preceding months. The inflammatory action is shorter, and runs more rapidly into the typhoid state. It is further distinguished by the disposition which exists to local affections of the internal viscera, as the brain, lungs, stomach, bowels, &c. The fever is also more diversified in its appearance, and attacks under a greater variety of forms, than the bilious inflammatory fever of the summer months. Sometimes the febrile excitement is high; the vibration of the arteries violent, strong and full, propelling the blood with accelerated impetus into every gland and viscus of the body. The face is flushed, the eyes watery and inflamed; the respiration anxious and oppressed; but these symptoms are as short as they are violent; in the course of ten or twelve hours the pulse loses its strength and fulness, and falls to the natural standard, or even below it. In other instances, there is scarcely any change in the state of the pulse from that of health, nor is the warmth of the body increased above its natural temperature, and sometimes falls below it. Nature, in this instance, seems to be

completely overpowered and oppressed, without the strength and elasticity of resistance. The inexperienced physician is often deceived by these delusive symptoms, which, however promising and free from danger they may at first appear, are the sure harbingers of impending danger.

This form of fever, in ordinary cases, attacks with pains sometimes fixed, sometimes wandering, often universal, like a general rheumatic affection, in others local: in a few, the attack assumes the symptoms of a catarrh, with a great degree of hoarseness; the parts most frequently affected, in such cases, are the lungs and pleura. The pain in the head, back and limbs, is at first severe. The patient complains of great sickness and oppression, and general distress; there is a frequent vomiting at first, of dark coloured bilious matter, afterwards of mucus; it is with difficulty that any thing can be retained upon the stomach; such is the weakness and irritability of this organ, that the blandest, as well as the most cordial substances, are oppressive and nauseating. Not unfrequently the patient is also affected with a flux or dysentery, attended with the discharge of black and very offensive matter. The pulse, in the progress of the disease, is either soft, feeble and frequent, or but little accelerated and almost imperceptible, and sometimes preternaturally slow and languid. The tongue at first is generally clean and moist; on the second day it becomes slightly furred, appearing of a dull lead colour, and not unfrequently it continues clean and moist till the final termination of the disorder in recovery or death. In others, the coat upon its surface becomes gradually darker and thicker, generally moist, glutinous and slimy; the dark sordes become at length perfectly black, extending to the mouth and adhering to the lips. I have seen this black matter nearly a quarter of an inch thick, and so dry and hard as to render the tongue almost immoveable; sometimes this crust cracks into fissures. The thirst is sometimes great, sometimes moderate, depending much upon the state and condition of the skin; where this is moist, there is little or no thirst, where dry and constricted, the thirst is more considerable; though in these cases it does not always occur, owing, perhaps, to an insensibility in the patient to the perception of natural appetites, and a destruction of the function in the organ of taste. The skin is commonly dry, stiff and impervious to the perspiration, and entirely destitute of moisture: in persons of full and sanguine habits, it assumes a dark red colour, exhibiting the appearance as if it had been bruised and beaten. When a moisture does appear, it is cold and greasy, and

confined to particular parts of the body. In a few, the skin is warm, soft and moist. Sub-saltus tendinum and twitching of the muscles, jerking of the limbs, the patient extending his arms to fanciful objects before him, picking of the bed clothes, as if with the design of removing vermin, delirium, and other nervous symptoms come on early. The eyes are red, dull, vacant and inanimate, or glaring with the dismal expression of hopeless misery and mental agony; the countenance sometimes exhibiting a strange and savage look, as if the patient's mind was laboring with the thought of intended suicide or secret murder. He is either insensible, with the vacant, wandering, stupid stare of an idiot, mumbling and muttering, but articulating nothing; or lethargic and comatose, with closed eyes and deep respiration; when roused from his stupor, he opens his eyes with affright or reluctance, mutters a few words indistinctly to the questions that are put to him, then falls again into his unnatural slumber. In others the derangement assumes a wilder form; the time is divided, with the patient, between perfect composure, in which he scarcely seems to breathe, and the incoherent raving of a deranged and distressed imagination; becoming sometimes quite sentimental and theatrical in manner and expression. The pulse here is but little altered, except in a diminution of strength from the healthy state: the body is cool, and the hands and feet below their natural temperature. Moments of recollection sometimes occur, like a flash of lightning through the black clouds of night; and a ray of intellect, now and then, darts across the mind, and renders the patient conscious of his own situation and of surrounding objects; then again the understanding is clouded, and every faculty of intellect buried in stupor, or dissipated in the erratic vagaries of a distempered fancy. When the nervous system is less oppressed, the patient compares his feelings to those produced by intoxication; "I feel," said a patient to me, "as if I were half drunk." Hiccup frequently comes on even at the commencement of the disease, often returning at short intervals. At a period somewhat advanced, varying in different patients, a yellowness sometimes overspreads the body, increasing from a light to a deep colour. The stools, which at first were dark green or blackish like tar, become mixed with blood. As the disease advances towards the fatal termination, the proportion of blood increases, appearing grumous and dissolved, and coming from the patient without his consciousness. The patient sometimes compares his sensations to that of a large ball, pressing upon the œsopha-

gus, and rendering deglutition difficult. Some patients are seized with horror at the sight of liquids, and are with much difficulty prevailed upon to taste them. When received into the mouth they are commonly thrown out again, either voluntarily, or by a convulsive motion of the pharynx, so that very little, if any, is received into the stomach. In other instances, the patient desires to drink, but is unable to swallow. I have known patients in other instances of fever, find no difficulty in swallowing whatever was presented to them, even in the last moments of existence.*—Hæmorrhagy not unfrequently takes place from the bowels; and the vessels of the lungs, themselves, sometimes give way, and the patient is in danger of suffocation. Without any premonitory symptoms, convulsions sometimes seize upon the patient, and agitate the body nearly to dissolution; from this shock, the progress is sure and rapid. For some moments, the patient is deprived of the appearance of life; at length the breathing returns; the pulse, in some degree, revives, but the intellect is permanently deranged; the patient lies with his eyes half closed, in a state of stupor and insensibility, or if any consciousness remains, it is only alive to misery: he is perpetually groaning, sighing and gnashing his teeth. Sometimes he is oppressed with an effusion of lymph; respiration is rattling, slow, and laborious; the intervals of breathing become longer, and life is terminated by an expiring gasp.

To an inexperienced person it might sometimes be difficult to distinguish a state of convalescence or solution of the fever, from the collapse of typhus. I have, myself, in the early part of my practice, been, in this way, sometimes deceived to the loss of my patients. Upon close examination, however, the distinction is not difficult; for though in the typhus, or asthenic state of fever, the skin may be cool, the tongue clean and moist, as it sometimes is, and the pulse soft and slow, or but little increased in frequency; yet the patient is often restless and anxious, his countenance is sunk and dejected, the evacuations by stool and urine continue unchanged; the stools are dark, black, perhaps bloody, and offensive; or the bowels remain obstinately constipated; the urine is high coloured; the skin is dry and shrunk, of unequal temperature in different parts, the warmth in the extremities being reduced below the natural standard, and increased in the region of the stomach and bowels, or

* According to Portal, a difficulty of swallowing and of speaking frequently depends on *engorgement* in the cervical portion of the spinal marrow.

the surface is covered with partial clammy sweats. The tongue in this state, is often foul and black, and more dry than in convalescence, though not invariably, where it is dry, crisp and horny, there is less liability to mistake. The general prostration is here much greater than after a solution of the fever, and there is no inclination for food of any description, as there often is after a crisis.

It is only in the early stage of the typhus or asthenic state of fever, that there can be any deception, for the increasing debility, the tremors and sub-sultus tendinum, the alienation of mind, coma, &c. which speedily succeed, unless prevented by appropriate means, soon remove all doubt as to the character and tendency of the symptoms.

Enlargement and chronic inflammation of the liver and spleen, are common consequences of the fevers here described.

The doctrine of critical days has been much agitated among physicians ever since the time of Hippocrates; but, however plausible it may be in theory, I have reason to think it is destitute of any solid foundation. Thus, during the same season, and in the same neighborhood, we frequently observe an attack of bilious fever to terminate completely in twenty-four hours by proper and energetic treatment; and in others, the disease is of various and uncertain continuance, from one week to two and three months.—When the disease continues thus long, however, it should rather be considered, perhaps, as fresh renewals of the disorder, than a continuation of the same fever. Though I have often known it to continue with very little interruption or abatement for twenty or thirty, and even forty days; the fever generally remitting once or twice in the course of the twenty-four hours.

CHAPTER XI.

PROGNOSIS OF ENDEMIC FEVER.

With regard to the prognosis, this is to be gathered from the nature of the prevailing epidemic, the habit and constitution of the patient, and the appearance of the symptoms.

In general, the more severe and longer the chill at the invasion of the paroxysms, the less dangerous is the disease.

When the fever comes on suddenly without any premonitory symptoms, the disease is more dangerous than when less sudden in its attack.

In old persons, who have been accustomed to the free use of spirituous liquors, the disease is generally of an unfavorable nature. In such, symptoms of collapse come on early; the irritability of the stomach is excessive; the vomiting almost incessant, and the insensibility to stimuli so great, that nothing seems to have any effect. There is often, in such persons, an absence of fever, or at least of an increase of temperature; the body and extremities being preternaturally cool; the surface dead, slippery, and clay like to the touch; the tongue and mouth are covered with a stooty fur; the pulse is feeble and frequent, or slow, creeping and receding from the touch. When the invasion has been sudden and violent, and the powers of life appear to be oppressed and subdued beyond the ability of resistance, and where coma and insensibility come on early, the disease, in general, hastens rapidly to a fatal termination.

A state of pregnancy is unfavorable to women laboring under bilious fever; though not always fatal, the disease is thereby rendered more severe and malignant. Hippocrates says that "any acute disease attacking pregnant women is fatal."* Dr. Russel says the plague was fatal to pregnant women, or at least, for the most part, produced abortion. Women near their time, died almost without exception, surviving delivery only a few hours. Some were de-

* Mulierem utero gerentem morbo quopiam acuto corripi, lethale.—*Hippoc. Alph.*

livered in the agonies of death; and the infant sometimes bore evident marks of infection.*

A state of corpulency and fatness is unfavorable in bilious fever. In fat persons laboring under fever, the circulation is weak, languid, oppressed and confined: apparently unable to reach the surface and extremities; the pulse at the wrist is feeble, tremulous, and scarcely perceptible, receding from the touch, and affording no resistance. The surface is moist, cool and doughy to the feel; or if the central parts are warm, the extremities are generally cool. In such persons the accumulation of fat seems to straighten and confine the blood vessels, acting with a compressing force upon their sides, and diminishing their capacities, whilst at the same time the blood is accumulated in the large internal vessels of the body, and overloads the heart with the dark carbonized and impure blood; occasioned, in part, by the imperfect action of the lungs.

The state of the skin, in connexion with other symptoms, is one of the best criterions; when this is soft, moist, moderately warm, free from any clammy or slippery feel; the extremities at the same time being warm, the intellect clear, and the pulse soft and free from languor and obstruction, the event is hopeful. If the evening exacerbations are followed by a general flow of warm and fluid perspiration, leaving the skin moist, free and open, though the other symptoms should be more unfavorable, we have reason to hope for a happy termination. On the contrary, where the perspiration is partial, appearing chiefly on the superior parts of the body, as on the forehead, neck and breast; and when the skin, upon being touched, feels cold and slippery, together with a coldness of the extremities, we may prognosticate an unfavorable event.† The same, also, may be apprehended from a dry, husky, and constricted state of the surface; or when the latter appears livid, diversified with purple blotches, or covered with petechiæ.

Though a yellowness of the body is not uncommon in this disease, and although it sometimes appears in cases that are not remarkably malignant, yet, generally speaking, it marks a disease of considerable severity; and when this yellowness is interspersed with livid or purple spots, or with streaks and blotches, we may with considerable certainty calculate

* Russel on the Plague, p. 95.

† Sudor optimus sane qui febram die judicatione tollit. Utilis autem et qui allevat. Malus vero frigidus, et ubi caput duntaxat et cervix insudat. Nam et temporis diuternitatem et periculum denunciat. *Hippoc. Coac. Prænot. p.* 207.

upon a fatal termination: convulsions, under these circumstances, are liable to take place at any moment, even when we might otherwise consider the patient free from danger. Yellowness is most frequently observed in emigrants from a northern climate.

When the teeth are dry, as if they had been exposed to the wind, or are covered with a black, viscid, and glary matter that is with difficulty rubbed off, the disease may be considered of a malignant character.*

When the pulse is not much accelerated in frequency and force; or when from small, frequent and intermitting, it becomes regular, less frequent, and more full, the symptom is favorable; a small, slow, irregular and intermitting pulse, indicates danger. Though the pulse be intermitting, yet if the other symptoms are not alarming, this circumstance alone is not to be considered dangerous. Should it occur, however, after the fifth or seventh day, together with an exhausted state of the system, debility of vital action, and a yellowness of the skin, it is to be regarded in an unfavorable light.

The appearance of the tongue, together with the other symptoms, assists in forming the prognosis. When it is covered with a white fur, it is generally a favorable sign, as indicating a degree of activity and vigor in the circulation, not liable to be suddenly and alarmingly depressed by the means that are employed to subdue the febrile action.—When, on the contrary, the febrile excitement is considerable, and the tongue is moist and clean, we have reason to apprehend the early appearance of typhoid symptoms.—When, however, this occurs in sanguine and plethoric habits, the danger is less, the strength of action being kept up by the natural vigor of the constitution. A smooth, dry, shining, fiery red tongue, without the appearance of papillæ, in acute fevers, is a dangerous indication, and is frequently connected with some local affection; when from the commencement the symptoms are less acute, the disease is protracted to a considerable length. Such a state of the tongue is often accompanied with a red, watery and desponding eye. In the advanced period of the disease, the

* Quibus per febres ad dentes glutinosus humor obnascitur, iis vehementiores fiunt febres. *Hippoc. Aph.* 53. Baglivi, speaking of the teeth, observes, that white teeth, in general, show a good chylification or a habitual sobriety; that when they grow soon foul and glary, the digestion is weak. He adds, "Take care of the teeth that you may digest well, and live long: they are the kitchen of the chyle."

tongue assumes a darker colour; if at the same time the skin is soft and perspirable, the appearance may be regarded as free from danger; but if the vomiting has been severe, and the strength of the circulation exhausted and worn out, a black, hard tongue, with black sordes adhering to the teeth, lips, and angles of the mouth, may be looked upon as harbingers of approaching dissolution.

Delirium, when unattended with stupor, is not dangerous; but when the patient is alternately delirious and comatose, the prognosis is unfavorable.

Deafness, occurring in acute bilious fever, is generally a favorable sign; though I have known some tedious and lingering recoveries, I never lost a patient where this symptom had taken place. Patients affected with deafness, according to my observation, are longer convalescent than others.*

Vomiting, when frequent and unattended by a discharge of bile, is unfavorable. At the invasion of fever, it is a common symptom; and as far as it is occasioned by the presence of bile, is unattended with any considerable danger; but when after the complete evacuation of all bilious matters the vomiting still continues, with the discharge merely of the drink received, or of viscid mucus, it is not free from danger. Under these circumstances, the strength is rapidly exhausted; the body becomes cold, the pulse feeble, and a cold clammy sweat is forced out upon the surface. When vomiting occurs in the advanced period from the weakness and irritability of the stomach, by which a dark coffee colored fluid, mixed with flaky matter, is discharged, the case may be considered hopeless.

A great degree of sickness and oppression at the stomach, without the power of vomiting, is an unfavorable symptom.

When the evacuations by stool are black, copious, and extremely offensive, or occurring in the advanced stage of the disease, they are unfavorable; if at an early period they mark a disease of considerable violence and of uncertain issue: if mixed with blood, or when they consist almost entirely of this fluid, they generally indicate a fatal termination.† When there are bloody stools, like the washing of raw beef, provided the other symptoms are favorable, the

* Quibus per febris aures obsurduerunt, sanguis ex naribus perfluens, aut alvus exturbata, morbus solvit. *Hippoc. Aph.* 60, *lib.* iv. *sec.* 3.

† Alvi excrementum nigrum vilut sanguis, et cum febre, malo est. Mala item quaecunque varia, et quae bili abundi sunt saturata. *Hippoc. Coac. Prænot.*

former may be considered as free from danger, and I have on several occasions observed them to mark a solution or crisis of the fever: but when these bloody discharges are accompanied with other typhoid symptoms, are black and offensive, appearing to consist entirely of grumous blood, they may be considered as indicating a fatal termination.*

Great and obstinate constipation of the bowels, the patient complaining that the substances taken proceed no further than the entrance of the stomach, occasioning there a sense of fulness, anxiety and oppression, which, after a longer or a shorter time occasion their rejection; the stools at the same time when produced either by cathartics, which with great difficulty are made to operate, or by the use of injections, are small in quantity, appearing of a light clay coloured membranous or flaky looking substance, more like the inner coat of the intestines than any excrementitious matter of their contents; this symptom, though not absolutely dangerous, generally marks an aggravated form of the disease; and more frequently occurs in young, robust and sanguine constitutions, or in persons of full and plethoric habits.

If the stools have been dark, bilious, copious and offensive from the first, and continue so through the progress of the complaint, the case is more favorable than when they become light clay coloured, small and less offensive; when from the latter condition they again become copious, dark and bilious, they generally mark a typhoid or asthenic state of the disease, and are not free from danger; when the bloody discharges are occasioned by griping and other dysenteric symptoms, they do not prognosticate any immediate danger.

Involuntary discharges from the alimentary canal, whether of blood or other matters, may generally be regarded as a fatal symptom. I have known this to happen, however, in the course of the paroxysm, in which, from the commencement, there was a complete abolition of intellect, without being followed by fatal consequences. But when involuntary discharges take place in the advanced or asthenic stage of fever, without being referable to any sudden abolition of intellect, stupor and unconsciousness, the prognosis is unfavorable; as also when such evacuations take place with the patient's consciousness, but when he is unable to go to stool in an erect position, the case, generally,

* In fevribus non intermuttintibus excretiones lividae, cruentae, biliosa et gravidentes omnes malae. *Aph.* 71, *lib.* vii. *sec.* 7. *Op.* p. 26.

may be considered hopeless. The patient complaining of great heat, when the skin, to the touch of another person, seems below or not to exceed the natural temperature. at the same time that he is affected with great thirst and desire for cold water and cold air, are symptoms which may be looked upon as unfavorable; more especially if great restlessness prevails, with a frequent inclination and effort to get out of bed and to escape from confinement.

The face and lips appearing extremely pale, inanimate, and bloodless—or livid and dejected, with an expression of pain or anxiety, is unfavorable.

When the patient faints upon being raised to an erect position, the danger is great.

Suppression of urine sometimes occurs, but unless in the advanced stage of the disease does not indicate danger, nor is it commonly of long continuance. A copious secretion of urine is a favorable symptom. In general, when the fever has a tendency to a favorable crisis, the urine is of a saffron colour. The urine in hot climates seldom deposits any sediment, which is probably owing to its being more acrimonious and alkaline; for upon adding a little lime juice or vinegar to it, a sediment takes place, as in the urine of febrile patients in northern latitudes.*

* The older physicians were very curious in their examinations of the appearance of the urine; and it may be remarked, that during the paroxym its colour is lighter, during the remission it is reddish, or the colour of strong ley, but without sediment; its assuming a light straw colour, and depositing a brick dust coloured or branny and floculent sediment, indicates a crisis or solution of the fever. "Urine," says Boerhaave, "which is thin and not disposed to settle, that is white, thin and watery, or straw coloured, and not turbid at times; or urine that is always turbid, and never settles, shows in many acute fevers retarded coction, much acidity, a difficult crisis, a long disease, and the greatest danger; and in inflammatory fevers of the most acute sort, almost certainly portends death; in moderately acute fevers it indicates a long and troublesome disease." *Boerhaave's Institutes, sec.* 1016. "In slow fevers," says Dr. Fordyce, "the urine is pale, in the increase of the fever the sediment is sometimes thick, rough, full of scales, and of a whitish colour; this furfuraceous appearance never fails to mark a long disease and a severe struggle, but manageable by great attention. How much contempt should light on those careless or unconscientious men who come and go to and from the bed-sides of their patients, in every sort of fever, without attending to the urine, or paying the least regard either to its flattering or fatal phenomena. *Fordyce on Fever, p.* 65. "The change in the humours," says Senac, "appears also in the urine itself. During the febrile action, that fluid is flame coloured, but as the paroxysm declines, becoming thick, frothy and very red, it puts on at length a brick dust colour. This colour appears in particular in the sediment, which is generally copious. * * Indeed, there is no solid reason to believe that the system is free from the fomes of the fever, while the urine retains its lateritious colour, or is in any measure tinctured with red. This phenomenon

Hiccup is a common symptom, from the presence of which alone little can be determined; since it as often attends cases of recovery, as it appears among the fatal symptoms towards the termination. When the other symptoms are not alarming, when the intellect is entire and unimpaired, the patient free from coma or stupor, from prostration or great debility, this symptom does not indicate danger. But when the vital powers are much exhausted or oppressed, the surface cold, the intellect deranged, or the patient is affected with stupor, it may be looked upon as the precursory symptom of a fatal termination.

Pain and swelling of the hypochondria are ominous indications.*

Such are the principal circumstances, which in the course of my practice have led me to judge of the event of the disorders with which they were connected. Different symptoms are noticed by different authors; but as every physician is more particularly interested in the diseases of his own country, upon a subject where so much might be said and still much be left untold, in giving an account of the

does not prove fallacious only in cases where the sick labour under some hepatic affection. If at any time the urine should exhibit a white matter settling copiously to the bottom of the vessel, this is to be considered as a favorable symptom, and even a sign of crisis in the disease. I must confess, however, that this phenomenon has but seldom fallen under my notice. *Senac on the hidden Nature and Treatment of Intermitting and Remitting Fever, p.* 133.

* "To patients in the prime of life," says Senac, "the cold fit of an intermittent is not often dangerous; but to persons advanced in years, it is very frequently so. The danger arising from the hot state of fever is not so great." *Senac on the hidden Nature and Treatment of Intermitting and Remitting Fevers, p.* 128. Perhaps the danger in the cold stage of remitting fever in aged persons and those much debilitated by sickness, is more dangerous than in the intermitting fever; more especially if the system has been much weakened by previous attacks. I have observed such patients, under these circumstances, die with stupor, coma, or derangement; the vital powers gradually declining as the cold stage progressed, stimulants being of no avail to rouse the declining vigor of the circulation, and bring about a reaction. It is observed by Dr. Lind, however, that he never saw a patient die in the cold stage of fever, and that according to his observation the hot stage was the most dangerous. The observations of Dr. Lind are as follows: "I never saw a person die in the cold fit, but have known several carried off in the hot one, by strong convulsions, a delirium, and other symptoms; and am clearly of opinion, that it is the hot fit, or fever, which most endangers the patient's life, and by its continuance, weakens and impairs his whole habit of body." *On the Diseases incidental to Europeans in Hot Climates.* As it respects my own practice, I have generally found the sweating stage to be attended with the greatest danger, except when active remedies have been employed during the paroxysm, so as to occasion a sudden collapse or prostration before the regular and natural appearance of the perspiration.

symptoms forming the prognosis, I have confined myself to such as are connected with the fevers of the country, and such, more especially, as have come within the sphere of my observation.

CHAPTER XII.

APPEARANCES ON DISSECTION.

The different organs and viscera of the body are liable to be affected in the endemic fevers of hot climates, leaving various traces of inflammation and congestion of blood, the consequences of violent excitement and local derangement.

The brain is less frequently affected than the viscera of the thorax and abdomen. The former, however, is by no means exempt. This might be inferred from the head-ache, delirium and stupor with which the patient is frequently affected. When the febrile excitement has been high, the vessels of the brain are found distended with dark fluid blood; yellow serum is sometimes found effused into the sinuses. Where the action has been languid, the brain is generally destitute of the traces of preceding inflammation; appearing white, with an effusion of water into the ventricles.

The heart is often found much enlarged, flaccid and distended with black blood; sometimes containing polypous concretions, extending into the larger branches of the blood vessels connected with it.

The lungs are frequently diseased; sometimes their substance seems to be destroyed, and the membranous covering filled with grumous blood; in many instances they are preternaturally tender and easily lacerated. Sometimes, when there has been any considerable degree of local affection in the chest, they are consolidated into a firm substance resembling liver, and completely impervious to the air, except, perhaps, a very small portion which remains free from such obstruction. The lungs are frequently united to the

pleura costalis; and in some instances ulcerations are discovered in their substance. On some occasions, effusions of yellow serum are found in the cavities of the thorax.

The gall bladder is generally filled with dark coloured viscid bile, of the colour and consistence of tar or molasses; sometimes this dark colour is owing to the bile being extremely thick and inspissated, and when diffused thinly over the surface of the knife, it assumes a green colour: in other instances I have found the bile in the gall bladder perfectly black, under every aspect in which it might be viewed:—the latter instances only show that the morbid process has made greater progress.

The liver is particularly liable to suffer in bilious remitting or yellow fever, as also in the intermitting fever. Various marks of derangement are discovered upon dissection. It is not unfrequently found much enlarged in its dimensions; sometimes pale, and at others of a dark brown colour, with variegated spots or streaks throughout its substance. The veins are commonly distended with blood, and ulcerations are discovered beneath a healthy surface. In some it is indurated, in others preternaturally tender and full of blood. Extensive adhesions are sometimes formed with the surrounding parts, as the duodenum, colon and diaphragm.

The spleen is also liable to be affected; being frequently much enlarged; sometimes it appears as a sack filled with blood; and not unfrequently it is found indurated.

The pancreas is sometimes ulcerated and enlarged.

The internal coat of the stomach and intestines generally exhibits more or fewer traces of inflammation, the veins appearing large, distended and livid. In those cases where there has been a vomiting and discharge by the bowels of a dark coffee coloured fluid, mixed with dark brown or black flaky matter, the same substance is discovered in the stomach and bowels after death. From what I have myself observed, I am inclined to consider this fluid, which goes by the name of the *black vomit*, as nothing more nor less than an altered secretion from the liver, or in other words, morbid bile, which finds its way into the stomach from the efforts of vomiting, or from the horizontal position of the body in bed, favoring its influx into this organ; where it is, in some degree, decomposed; the albuminous portion of the bile mixing with the fluids of the stomach and bowels, leaving the resinous matter free and unconfined, in the form of a black, or dark coloured powder, or rather flaky substance, consisting of the resinous and carbonaceous portion of the bile, and which is discharged by vomiting and stool.

It appears to be from the solution of the black bile in the stomach and bowels, that a dark brown, or coffee coloured complexion is given to the fluids of the *primæ viæ*.

In the dissection of the bodies of those who died of the fever in Philadelphia in 1793, by Dr. Physick and Dr. Cathrall, we are informed that the stomach appeared spotted in many places with extravasations, though free from appearances of inflammation. The inner surface of the intestines was inflamed; but what is more to our purpose, as showing that vitiated bile and the black vomit are the same thing, the stomach contained, as did also the intestines, a black liquor similar to that which had been discharged by vomiting and purging before death. "This black liquor," we are told, "appears clearly to be an altered secretion from the liver; for a fluid in all respects of the same quality was found in the gall bladder. This liquor was so acrid that it induced considerable inflammation and swelling on the operator's hands, which remained some days."* Dr. Robert Jackson, speaking of the appearances on dissection, remarks,† that "where black vomiting has taken place, the gall bladder is more or less full of bile, often black and thick like tar or molasses; the gall ducts are enlarged, and the bile is traced into the duodenum, tinging with its sooty colour, the contents of the stomach and intestines." Similar observations have been made by others; and yet it has been contended by some physicians that the black vomit is an altered secretion from the stomach itself, and in which the bile has no concern; occasioned, as is supposed, by a mixture of the broken and extravasated globules of the blood, blended with the other vitiated secretions of the stomach. The arguments in support of this opinion are, 1. That unlike the bile, the black vomit is destitute of bitterness: 2. The bile, though appearing black, yet when spread upon a thin surface, appears of a yellowish green: 3. The gall bladder being sometimes small and contracted, containing but little bile, whilst at the same time a very considerable quantity of black vomit has been discovered in the stomach after death: 4. The gall bladder containing sometimes a colourless fluid, whilst at the same time black vomit was found in the stomach.‡ To the first objection it may be answered, that the stomach possesses the power of changing the sensible properties of substances received into

* Rush's Inq. & Obs. Vol. III. p. 73–4.
† Outline of the History and Cure of Fever, p. 211.
‡ See the Philad. Med. Mus. Vol. IV. p. 26.

and contained in it. The second objection is not supported by facts; for others, as well as myself, have seen the bile in the gall bladder perfectly black, however thinly diffused over a clean white surface; and, were it otherwise, it is very probable that the stomach might possess the power of changing its colour and appearance. The third objection proves nothing; for the probability is, that the bile is poured into the duodenum and stomach nearly as fast as it is secreted. The circumstance of the fourth objection, is what I have myself never observed in bilious fever: it is true, that in protracted bowel complaints or dysenteries which have terminated fatally, I have sometimes found the gall bladder filled with a transparent colourless fluid, but I have never seen any thing of this nature in bilious fever, and in this particular the general experience of physicians corresponds with my own observation. That the black vomit is vitiated bile or a morbid secretion from the liver, appears from this: at the commencement of fever, great quantities of discoloured bile are discharged from the stomach and bowels, but no black vomit; as the disease advances, the bile changes to brown, olive, corbo, coffee coloured, and finally to black.—The exhibition of a cathartic brings away great quantities of this brown, olive, or black matter, but no green or yellow bile, which it should do, were the bile and the black vomit two distinct and different fluids.

The numerous appearances of local inflammation which are discovered upon dissection in the different viscera of the body, have led to the conclusion, that copious bloodletting is necessary for their removal. This opinion, however, will appear less true than plausible, when it is recollected, that it is in fevers of the most malignant character, and in which typhoid or asthenic symptoms supervene at an early period, that these affections are most apt to take place. It is true that on many occasions these local inflammations are attended with considerable pain in the part affected; but it is also equally true, that, in perhaps the greater number of cases, the pain or uneasiness has been so obscure as to escape attention, and that even in instances which have ultimately proved fatal. Thus, an incipient inflammation of the liver, commenced and produced by the fever, but which at first excited no attention, continues after the recovery from the fever, and goes on increasing till it sometimes ends in suppuration. It was observed, likewise, by Dr. Chisholm, that of those who died of the pestilential fever in Grenada, in 1793, the lungs were found highly inflamed, and of a livery texture and hue; "a circumstance

the more extraordinary," he remarks, "as no symptom of a marked pulmonary affection could be perceived during the existence of the disease.* Instances are also recorded by Morgagni, Van Swieten, De Haen, Pringle and others, in which traces of considerable inflammation were discovered, though that had not been previously indicated by any degree of pain.

These appearances of inflammation on dissection in malignant diseases have been explained by Burserius in a manner different from the opinion commonly received. He ascribes them to the dissolved state of the blood; and refers to *Ludwig. Advers. Med. Prac.* in support of his opinion.—"For it is a well known fact," says he, "how much the death of patients has been accelerated by those who, deceived with the appearance of such false inflammations on dissection, to guard against or remove them, in malignant and putrid diseases of that kind have not hesitated to employ copious and repeated bleeding."†

It was long since remarked by Riverius, that "acute and malignant fevers scarcely ever occur unaccompanied by inflammation in some one of the viscera." And he cautions us in another place, that we ought constantly to recollect, that all those fevers with which local inflammation is conjoined, are not symptomatic, but often idiopathic, and that the inflammation supervenes, not being the cause but the consequence of the fever.‡ "Thus," he adds, "we frequently observe in practice, that patients labor under continued fever for a day or two before pain of the side and other symptoms of pleurisy appear; thus, also, many persons, on the third or fourth day of fever, fall into inflammation of the brain," &c.§

We are informed by Dr. Home, in his account of the yellow fever of Jamaica, that he found in several dead bodies the liver enlarged and turgid with bile, and of a pale yellow colour. In some, the stomachs were inflamed, and marked with black spots of the size of a dollar.

In the yellow fever, Dr. Jackson states, that the brain, upon dissection, appeared to be more or less affected in the majority of subjects who died in the acute state of the dis-

* Chisholm's Letter to Haygarth, p. 136.

† Burser. Prac. of Medicine, Vol. I. p. 69.

‡ Quae febram istam non efficit, sed illi potius succedaneum est.

§ Sic nobis frequenter in usu practico videre licet aegrotantes, ab initio febri continua laborantes per unam aut alteram diem, antiquam dolor lateris et alia pleuritidis signa appareunt: sic multi tertia vel quarta febris die in pleuritidem incidunt, &c. *River. Prax. Med.* lib. xvi. cap. 1.

ease; the membranes either inflamed, or the blood vessels turgid to an extraordinary degree, give an appearance of commencing gangrene, rather than of inflammation, properly so called; water was sometimes found in the ventricles, with evident effusions into the interstices; but was an effect not general, nor even frequent. "The liver and lungs," says he, "are sometimes, as it were, suffocated and oppressed; the lungs are like a bag filled with grumous blood, the liver and spleen distended with black blood, in such a manner that the coverings are sometimes ruptured.*

Dr. Mackittrick, in his inaugural dissertation upon the yellow fever of the West Indies, says that in some of the patients who died of it, he found the liver spleacelated, the gall bladder full of black bile, and the veins turgid with black fluid blood.†

Dr. Broag, who performed many dissections in yellow fever, and in the dysentery of hot climates, observes, that the liver was almost always found diseased.

By way of further and collateral illustration of this subject, I will here subjoin a few observations on the appearances on dissection in other forms of malignant fever, as well as in the yellow fever itself. For some of these observations, I am much indebted to Vol. XV. Part 1, of Dr. Rees' New Cyclopedia.

Dr. Paloni, in his account of the yellow fever of Leghorn, informs us, that the lungs were gorged with blood, so that when cut they resembled liver. The stomach was gangrenous, especially its internal coat; was filled with black matter similar to that vomited, and had its whole vascular system turgid with blood. The intestines were mortified throughout their whole length; and the small ones, in particular, were filled with mephitic vapor. The kidneys manifested symptoms of inflammation, and the urinary bladder was empty and marked with gangrenous streaks.

It is stated by Sir John Pringle, that when the jail fever proved fatal it terminated in actual mortification of some part, that the intestines; in particular, were apt to mortify, and that abscesses were found in the brain. In the numerous dissections of those who died of the plague at Marseilles, and of the malignant fever at Rouen, some of the viscera were always found in an inflamed and gangrenous state.‡

* Jackson on Fever.

† Rush's Inq. & Obs. Vol. III. p. 170.

‡ Traite de la Peste, part 1. Le Cats' Act. of the Malig. Fev at Rouen. Phil. Trans. Vol. 49, part 1. Hoffman de Feb.

In the account of an epidemic fever which occurred at Genoa, in the year 1805, published by two physicians, it is stated by both that congestion of blood was found in the brain, but in other cases the brain was in a natural state. And a Dr. Eisfield, who published an account of an acute typhus, as it prevailed at Leipsic, in 1799, observes, "in very careful dissections of the brain, though I only once detected an abscess, and this was in the right hemisphere, about half an inch in diameter, the vessels, particular those in the vascular membranes, almost always appeared turgid with blood. The four ventricles abounded with water, and sometimes a good deal of extravasated blood was present.—The cortical substance was inflamed, soft, and flaccid."* It was observed by Chambon,† that the substance of the brain, in every part, is often found harder than natural after malignant fever. This, Dr. Clutterbuck remarks, we know to be a common effect of inflammation in other parts.‡ In an answer to this opinion of Dr. Clutterbuck, that the proximate cause of fever is seated in the brain, the writer in Rees' Cyclopedia judiciously remarks, that not only, are these congestions and inflammatory phenomena of the brain frequently absent, but sometimes together with them, and not seldom in their absence, similar appearances are observed in other viscera, more especially in those of the abdomen. Dr. Munro included other organs with the brain, in his mention of the morbid changes produced by fever; and Dr. Pringle remarks, that when contagious fevers prove fatal, it generally terminates either in actual mortification of some part, or in an abscess of the brain; and he adds, that the intestines, more particularly, are disposed to mortify. He likewise quotes the Traite de la Peste, to prove that some of the viscera were always mortified and inflamed, the brain and lungs most frequently, in those who died of the plague at Marseilles. Dr. Eisfield, continuing his description of the appearances discovered by dissection of those who died of the Leipsic fever, says, "the lungs were often found destroyed, inflamed, ulcerated, gangrenous, covered with exuded lymph. The liver inflamed, (especially the concave surface,) tender, flaccid, full of blood, or pale and bloodless. I did meet with inflammation and gangrenes of the uterus, the urinary bladder, the prostrate and other

* Beddoes' Researches, Anatomical and Practical, concerning Fever, as connected with Inflammation, p. 48.

† Obs. Clim. Prac. Obs. 29.

‡ Inquiry into the Seat and Nature of Fever, part 1, p. 173.

glands, particularly the mesenteric, of the colon and rectum." "The pains in the head were sometimes so violent, and the delirium so furious, as to indicate inflammation of the encephalon, which, however, was discovered in the abdomen." In three dissections of persons cut off by an epidemic fever in Normandy, Dr. Moncet found the vessels of the brain and its membranes gorged with dark blood; the lungs were also diseased, all the ramifications of the mesenteric arteries full of black coagulated blood; the intestines in part inflamed, in part putrid and gangrenous, in two of the cases a prodigious congestion in the small curvature of the stomach and in all the intestines, especially the small.—Of the fever which raged at Leghorn in the summer of 1804, Thiebault reports, that there were few of the viscera which it did not leave sometimes sound, sometimes gangrenous, or at least with black spots upon the surface. This alteration was especially seen on the concave part of the liver, the inner surface of the stomach and intestines, often in the right side of the lungs and diaphragm: the abdominal viscera, and still more the abdominal muscles, were excessively flabby and tender. The cavities of the thorax and abdomen, the pericardium and ventricles of the brain, contained a yellow liquid, often fœtid, and of a dark bloody tinge. The superficial vessels of the viscera, especially those of the brain and intestines, appeared dilated, and their extremities filled with black matter. "Nothing was found constant but the gangrenous nature of the alterations, and their being more concentrated on the stomach and intestines than in the other viscera. Palloni* gives a very similar account. In his dissections, the force of the disease still more plainly appears to have been exerted upon the abdominal and contiguous viscera. During a similar epidemic in 1800 in Spain, Professor Sabater and Ramos found in the abdominal viscera saneous and purulent effusions, with gangrene. It is expressly said, that in two other great cavities, the head and the thorax, essential changes were seldom found. In some subjects, however, black gangrenous points appeared upon the lungs, and in others upon the brain. The alterations in the abdomen were the only ones that can be considered as the direct and immediate product of the disease. Dr. Ffrith, house surgeon to the Philadelphia Dispensary, informs us, in his dissertation on malignant fever, (1804,) that the brain was generally found in a diseased state, the meninges being considerably inflamed, the dura mater being some-

* Obser. Med. Livorno, 1804.

times agglutinated to the pia mater, the blood vessels turgid with blood as if injected, the brain firmer than usual, water frequently in the ventricles, and sometimes blood effused between the meninges. The stomach was always diseased; great inflammation observable throughout; erosions of the villous coat frequent; inflammation extending to the intestines; bladder diseased; liver, spleen, pancreas, kidneys generally sound; lungs, pericardium and heart inflamed.—The writer in Rees' Cyclopedia adds, that "in two cases we lately investigated by dissection, the villous coat of the small intestines was ulcerated in parts, and altogether destroyed in others; the brain, at the same time, bore marks of great congestion in one case, and its ventricles were much distended with serum in another.*

* See Rees' New Cyclopedia, Vol. XV. Part 1.

It may not be out of place, nor uninteresting, to point out a few of the circumstances of analogy between the operation and effects of morbid and other poisons, as those of the animal and vegetable kingdoms.

Dr. Cooper found in an animal destroyed by stramonium, (Jamestown weed,) two drachms of water in the ventricles of the brain; and dissolved blood appeared in the blood vessels, and dark coloured bile in the intestines and gall bladder. In two persons who used the boiled leaves in New-Jersey, violent diseases supervened; mania in one, and tetanus in another.—(*Barton's Lectures on Mater. Med. as quoted by Cooper. Cald. Col. Thes.*) Two children who had eaten of the seeds, seemed to labor under hydrophobia, according to Dr. Lobstein. (*Ibid*) According to the experiments, and observation of Dr. Patrick Russel, made in Hindostan, a general stupor and disposition to sleep, were induced in several instances when the bite of the Cobra de Capello was accidentally inflicted on the human body.—(*Dunc. An. of Med. Vol. II. p.* 13.) "I have it from respectable authority," says Dr. Pascalis, "that the bite of a certain venomous snake in Martinico has been known to be attended with considerable jaundice.—(*Cox's Phil. Med. Mus. Vol. III.*) Convulsions were produced in animals by the poison of the viper and other poisons inserted into wounds, according to Fontana.—(*Fontana on Poisons, Vol. I.*) "The symptoms which follow on the bite of a viper," says Dr. Mead, "are great faintness, and a quick, though low, and sometimes interrupted pulse, great sickness at the stomach, with bilious convulsive vomitings, cold sweats, and sometimes pains about the navel; the colour of the whole skin, in less than an hour, is changed yellow, as if the patient had the jaundice.—(*Mead's Works, p.* 21. *On Poisons. Of the Viper*)

The Indians in South America, who hunt with arrows poisoned with the ticunas, eat, with impunity, the flesh of animals thus taken.

Fontana found that the space of time that elapses before the venom of the viper gives manifest tokens of the disease it produces, is from fifteen to twenty seconds, or thereabouts.—(*Fontana on Poisons, Vol. I. p.* 297.) It was observed by the same author, that by injecting the venom of a viper into the jugular vein, the blood was in most instances coagulated, though some-

CHAPTER XIII.

OF THE PREVENTION OF FEVER.

It is evident that the prevention of fever must be founded upon the knowledge of its remote causes, and the means of counteracting or removing them.

We have seen that the remote causes are, principally, noxious exhalations from putrefying animal and vegetable matters. In many instances it is not in our power to remove or remedy these evils, particularly when they are widely and generally spread over an extensive country. But when they are more limited and local, much may be done by human means and industry. Marshes may be drained, ponds ditched or filled with earth, stagnation of water guarded against, inundations prevented, &c.

The preventive remedies of fever naturally divide themselves into personal and local.

times fluid, and of a black colour, and that extravasated black blood was seen in various parts of the body; in the heart, lungs, intestines, adepose membrane, &c.—(*Ibid, Vol. I. p.* 359.)

The production of jaundice, convulsions, vomiting, and painful and spasmodic retraction about the navel, are the common consequences of the operation of all poisons.

It was observed by Fontana, that in animals, the parts that have been bit by a viper pass in a short time to the strongest putrefaction, and present gangrenes and sphacelations. The skin is suddenly corroded and destroyed; the muscles are black and fœtid; and the adepose membrane dissolved. "I have known," says he, "a rabbit die in less than three hours, with the muscles of the leg already gangrened throughout their whole substance; they were black and offensive, and were divided with a knife without any resistance. In a word this putrefactive tendency of the muscles, in animals that have been bit by the viper, cannot be denied, and is occasioned by the change wrought in the blood by the venom."—(*Ibid, p.* 403.)

The poisons of the viper and of the ticunas, prevent the blood with which it is mixed, from coagulating, and turn it of a dark black colour.—*Fontana on Poison, Vol. II. p.* 125. According to the experiments of Dr. Langrish, laurel water possesses the same property of producing a dissolution in the crasis of the blood. And the bite of the Lybian serpent, the haemorrhois, possesses this quality in so remarkable a degree as to cause the blood to exude from every pore in the body.

Fontana found the lungs of animals destroyed by the poison of the ticunas more or less spotted; the spots being frequently very large and livid, and sometimes the part seemed quite putrid.—(*Fontana, Vol. II. p.* 126.)

There is a peculiarity in the cherry laurel, inasmuch as the water of this poison does not kill when injected into the veins, or applied to wounds; but suddenly when taken into the stomach.—(*Ibid.*)

SECTION I.

Of Personal Remedies as Preventives of Endemic Fever.

In my treatise on scurvy, I have there pointed out the agency of animal food as one of the principal causes in the production of that disease: from the analogy of fever and scurvy, as well as from experience, the same observations are applicable here. The general experience of physicians confirms the utility and importance of abstinence from animal food in hot climates and unhealthy places. When the theory of acidity in the fluids, as the proximate cause of certain kinds of fevers and fluxes prevailed among physicians, fruits of every description were considered as injurious to the healthy and the sick; to the former, as favoring the attack of disease; and to the latter, as aggravating its symptoms: and thus the most salutary antidotes were avoided, and considered as only affording a tantalizing temptation to the longing appetite in the luxurious abundance of purple clusters and forbidden fruits. But these unfounded and erroneous notions are giving place to more rational and juster conceptions. Who that will but for a moment consider the wise economy of nature, will not observe the most salutary provision for man's health and enjoyment; and every where find that wherever the bane of human life exists, there also the antidote is afforded? Thus in cold northern climates, where the shortness of the summer scarcely causes fermentation in animal and vegetable matters, and where the low degree of temperature does not admit of the deleterious evolution of noxious miasmata, we there find that the inhabitants are almost entirely exempt from the diseases which owe their origin to noxious exhalations. Hence the preservatives of health, which become necessary in hot and tropical latitudes, are there conveniently dispensed with. In those frigid regions, the human body can scarcely be too highly animalized by nutritious viands; there also, instead of the acescent fruits, the oily nut furnishes them with a rich dessert. In cold and northern climates, it becomes necessary that the blood should be enriched during the inclement season of winter by the liberal use of animal food, which, by affording a large proportion of red globules and gluten, thickens the vital fluid, raises the temperature of the body, and enables it to resist more effectually the frost and cold by which it is assailed.

As we advance from the temperate zones towards the poles, we find that the quantity and proportion of fruits, herbs, and vegetable growth of every description, gradually diminish; until, at length, we arrive at a region of perfect sterility and eternal desolation: no verdant hills and flowery vales meet the exploring eye, nor within the circle of an extended horizon does any thing present itself but a dreary melancholy waste: mountains of snow and ice rear their frozen summits from the vales, and chill the air with the benumbing breath of everlasting winter; yet even here, upon these outskirts of the earth, we find that man has fixed his habitation; here he cherishes the social virtues and the kindred sympathies which unite him in the bonds of affection to his wife, his kindred, his children and his friends; here he finds a home, which he would not exchange for all the luxuries of the Indies, or the wealth of kingdoms. Sufficient, as a garment, for the simple Greenlander, is the furry covering which warmed the bear; whilst the train oil of the whale affords him a most delicious banquet.

But, to return from this digression, my object was to show that the increasing salubrity of climates, as we advance towards the poles, compensates for the decrease of vegetable food; so that in the cold and barren regions of the north, the inhabitants may generally subsist with safety almost exclusively upon the flesh of animals. In a former work,* however, I have shown that to this there are certain exceptions; and that although the natives of these northern climates are free from the endemic fevers of the south, yet that their gross diet of animal food has sometimes given rise to scurvy and scorbutic disorders of a very malignant and fatal character.

In warm climates, where miasmatic exhalations are greater, we find a more liberal provision of fruits and vegetables to counteract their pernicious tendency. As we approach the equator, we still observe this wise provision and economy of nature, keeping pace with the demands and necessity of mankind; and in the tropical latitudes, where fever puts on a malignant aspect, and reigns throughout the year, we find the most prodigal abundance of those sovereign antidotes. Here man's health is consulted, and his appetite gratified with the banana, the milk and fruit of the lactiferous palm, the fig, the pine apple, the orange, the lime, the lemon, &c.

* See Observations on Scurvy. Topography and Diseases of Louisiana.

In more temperate climates, we find that the fruits begin to ripen at that season of the year in which they are most required: that is, in the latter part of summer, and in autumn, when the causes of sickness prevail, and disease makes its appearance. During the earlier part of the season, the unhealthy products of decaying animal and vegetable matter had been prevented from contaminating the atmosphere in any considerable degree, by the rapid growth of vegetation, which appropriated to its nourishment and increase the otherwise deleterious products of putrefaction; but towards the close of summer, vegetation is less rapid, and comes nearly to a stand; as vicarious of this salutary process, however, nature presents us with the delicious fruits of the season; which, being of an acid and accescent quality, serve to prevent, decompose, and carry off redundancy of bile, and to sweeten and purify the blood.

Such are the wise provision and economy of nature, directed by an overruling Providence to minister to our benefit and welfare: nor can there be a doubt, that in proportion to the prevalence of the causes of endemic fever, does the exclusive use of fruits and vegetables become the more necessary; so that during the summer season, in hot and unhealthy climates, these articles, to the exclusion of animal food, should constitute the diet of the inhabitants.

The same effects are found to take place from the operation of noxious miasmata, as from the use of animal food and spirituous liquors: that is, they all have a tendency to increase the alkaline state of the fluids, and consequently, to occasion an undue secretion of bile; and we accordingly find that fruits and vegetables are no less necessary in the prevention of fever, than in the cure of scurvy.

What would be the effects of substituting animal in the place of vegetable food, in unhealthy climates during the summer season? Why, agreeably to my experience, as well as that of every other physician who has made any observation under such circumstances, fevers and fluxes would be the inevitable consequences. I have uniformly found this to be the case in all parts of the southern portion of the United States, wherever it has been my fortune to have charge of the health of troops stationed at any particular post. This was strikingly exemplified in East Florida, in the year 1818, during, and subsequent to the campaign against the Seminole Indians. At that time it was impossible to procure fresh vegetables. The country was an uninhabited wilderness, and the troops were obliged to subsist for a considerable time, entirely upon pork and bread: and

in a country where so much warmth and humidity prevails, it will readily be supposed that these articles were in an unsound and partially spoiled condition; which state was still further increased by the exposure to which the provisions themselves were subject, from the want of store houses and shelters. The sickness was, consequently, unusually great among the soldiers.

We observe in nature, a propriety and order which cannot be sufficiently admired. In the summer season, we behold the branches loaded with refreshing and salutary fruits, and the prolific vine bending in luxuriant festoons with its purple clusters. As the season advances, and the causes of disease diminish, this profusion gradually declines; enough, however, still remains for the necessities of man: adapted to the season, and in succession to the acescent fruits, the oleaginous nuts are offered to our acceptance.

It would scarcely be supposed that the instructions of science and philosophy were required to teach mankind such plain and palpable precepts and demonstrations of nature. Instinct, herself, would direct them to the use of means and provisions so grateful and congenial to their appetites, and so conducive and salutary to their health and comfort; but man's blind and erring reason diverts him from the path of safety, and there enjoins caution and forbearance where nature cries indulge.

It is not so much from the heating and stimulating operation of animal food, that its use proves injurious in hot and tropical climates; but its hurtful operation is to be attributed to its producing an unhealthy condition of the fluids, already too highly animalized* by miasmatic matters blended with them. That such an unhealthy condition of the fluids does take place, the experience of every person who has resided for any considerable time in unhealthy climates must abundantly confirm: he has there, undoubtedly, experienced an undue secretion of bile, and found the necessity of an occasional cathartic or emetic to carry off this hurtful redundancy. It is to counteract this disposition of the fluids of the body that fruits and vegetables are so absolutely necessary during the summer and autumnal seasons.

It is owing to their temperance and to their light acescent diet that the Brahmins in India, the natives of the Canary Islands, Brazil, &c. who subsist almost entirely on fruits, herbage, grains and roots, live so exempt from disease. It

* By *animalized*, may be understood that condition of animal bodies which constitutes a chemical difference between them and vegetable substances.

is true the religion of the Brahmins prohibits the use of animal food; but the wisdom and utility of their religion, in this respect, is founded on nature and experience.

"A man of vigorous constitution," says Tissot, "lives healthy and strong upon bread, water and milk, to one hundred and fifty, while those who study nothing else every day but new varieties of food, hardly reach the age of fifty, with frequent sickness too."

The advice of Solomon, that oracle of wisdom, is worthy of being remembered: "Be not greedy in thy banquets," says he, "and give not thyself over to meat; for in much meat there is sickness. Many have died through fulness, but he that is temperate lengtheneth his life."

It may be contended that animal food is necessary to support the strength of the body under the oppressive and exhausting influence of the summer heat; but how happens it that the negroes in the West Indies, and on many plantations in the southern states, are able to work sixteen hours out of the twenty-four, and never taste a mouthful of flesh throughout the year? It is to this want of animal food that their exemption from disease, notwithstanding their fatigues and exposure, in a great measure is to be ascribed.*

We are informed by Mr. Verdom, that the Greek christians in Smyrna, during the season of Lent, when they eat only vegetables, are very seldom attacked by the plague, whilst among those who eat flesh the disease makes great havoc.

It is remarked by Aurivilius, that those who live on pork and fish are more subject to fever than others.

Dr. John Sherwan, in his observations on the bilious diseases of Bengal, speaking of the mortality among the Europeans, and contrasting it with the health of the natives, makes the following pertinent reflections. "Let us," says he, "take a view of the customs of the original natives. They eat little or no animal food; they drink water, or

* "A vegetable diet," says Dr. Falconer, "by keeping the passions within due bounds, is a remarkable preservative of purity of morals.

"Whilst the people of the East, in general, are immersed in debauchery, profligacy, and all kinds of wickedness, the natives of India are regular in their conduct, and just and merciful in their dealings.

"A diet of this kind is, in the main, very favorable to the mental faculties.

"The great degree of bodily strength, and consequently tense fibre, produced by animal food, is also inconsistent with that delicacy of sensation, which is the parent of liveliness of imagination, quickness of apprehension, and acuteness of judgment."—*Falconer on the Influence of Climates, Customs, &c.*

aqueous fermented liquors with the juices of fruits or plants, and milk; and they live almost entirely free from bilious disorders: yet they breathe the same noxious effluvia that we do, and are much more exposed to the heat of the sun." And that this difference is not entirely owing to the circumstance of the natives being accustomed to the climate, he says, "Every one must have observed, that the black people who have adopted the language of the Portuguese, and who indulge in the luxuries of the Europeans, are not exempt from bilious or putrid disorders."*

The exemption of negroes in sugar colonies from diseases which rage among the whites, and even among the domestic slaves, is justly attributed by Wilson, in his Essay on Climate, to the vegetable diet on which those unprivileged laborers subsist.

Many lives have been lost to the public service in consequence of soldiers being obliged to subsist upon too great a proportion of animal food. It is contended that in provisioning an army it is necessary for the convenience of transportation, to select such articles as contain the greatest quantity of nourishment in a given bulk. If, however, the strength of an army depends upon the health and soundness of the troops, it will doubtless be granted, that for the purpose of securing these advantages, some sacrifice should be made on the part of convenience. From what has already been said, it will clearly appear that a deficiency of vegetable food will be more severely felt in hot, than in cold and temperate climates. A diet that might be comparatively healthy on the northern frontier, would prove highly pernicious on the southern. This was strikingly exemplified in the fatal epidemic and scurvy of Terre aux Bœufs, in the year 1809.†

Dr. Rush, upon this subject, has made some judicious observations. "The diet of a soldier," says the Doctor, "should consist chiefly of vegetables. The nature of their (*his*) duty, as well as their (*his*) former habits of life, require it. If every tree in (*on*) the continent of America produced Jesuit's bark, it would not be sufficient to restore the health of soldiers who eat one or two pounds of flesh in a day."‡

* Duncan's Annals of Medicine, Vol. VI. p. 475. The great fatality which at one time attended the small pox, was at last prevented by the exclusive use of a vegetable diet.

† For an account of this disease, see Observ. on the Topog. & Diseases of Louisiana.

‡ Rush's Directions for preserving the Health of Soldiers. Addressed to the Officers of the Army of the United States.

In illustration of the pernicious effects of the inordinate use of animal food, it was observed by Dr. Huxham, that "the Spanish and French prisoners, by eating unusual and immoderate quantities of flesh, brought on such dangerous fevers as carried off vast numbers of them; they were so fond of it, that they frequently died, as it were with flesh in their mouths."*

Dr. Jackson remarks,† that the French and Spaniards eat less animal food, and drink their liquors greatly more diluted, than the natives of England, and that their greater exemption from disease bears some proportion to the degree of abstemiousness observed.

Dr. Lind, speaking of the diseases incidental to Europeans in hot climates, observes, "It is, indeed, a truth confirmed by most fatal experience, that their devouring large quantities of flesh meats, and using the same heavy obdurate food in the West Indies, or upon the coast of Guinea, and in other warm countries as they were accustomed to at home, have proved the destruction of many thousand English in those climates.‡

It is stated by Dr. Nassy, in his History of Surrinam, that the Jews of that country who subsist principally upon fruits and vegetables, and use a considerable quantity of pepper and spices in their food, escape the bilious fevers; whilst the christians, who indulge in their European luxuries and viands, perish in great numbers.

One effect of heat is to diminish the appetite, in consequence of the lessened vigor of the digestive organs. A native of the northern states migrating to the south, is at first astonished at his own voracity when compared with the moderation and abstemiousness of the southern natives.—His appetite, however, as well as his constitution, becomes acclimated in a great degree to his adopted country, and he finds that he is satisfied with a much smaller quantity of food than when he inhabited his native region of the north. Persons residing in the same climate find that a long continuance of heat during the summer, impairs their appetites and diminishes their relish for solid food. The inhabitants of the West India islands, at the time of their discovery by Columbus, were astonished and alarmed at what they considered the excessive gluttony of the Spaniards; one of whom devoured in a day, nearly as much as would have

* Huxham on Fever, p. 56.
† Diseases of Jamaica, p. 161.
‡ Diseases of Hot Climates, p. 23.

been consumed by a native in a week. It is remarked by Baglivi, that the inhabitants of Rome eat very little, and that their food consists principally of vegetables. He further observes, that strangers who go there, by degrees lose their appetites. Nature, though at war with man, is seldom wrong in her indications, as far as it regards that which concerns his health and comfort; and this lessened appetite, produced by heat, is his best security from the diseases which this increased temperature is apt to occasion.

The use, or abuse of spirituous liquors, is an improvement of the moderns, which so far from remedying the inconveniences and hardships of a military life, is but adding to the evils which are almost inseparably connected with it.—When the Romans made war in hot countries, their common drink was vinegar mixed with water, which they called *posca*.* But with our army it is a matter of indifference whether they are exposed to the winter's cold of the Canada frontier, or to the summer's heat of Florida, spirituous liquors are in every situation equally indipensable.

To this it may be answered, that if the free indulgence of spirituous liquors is so injurious, how comes it that habitual drunkards, and persons who keep themselves constantly under the influence of ardent spirits, frequently escape the endemic fevers of unhealthy seasons and situations? To this I would reply, that intoxication, or the operation of spirituous liquors, produces, for the time, an insensibility to other impressions; but that unless this excitement is kept up with tolerable uniformity, the body is rendered more liable to be attacked during the period of atony and relaxation which follows the state of previous excitement; and it has been found that whenever persons of this description become the subjects of fever, it is very apt to prove fatal, or to assume an aspect of unusual malignancy. It was observed by Dr. Rush, that most of those who were alternately drunk and sober, died of the yellow fever. I had also occasion to remark this in a public hospital, where a man was selected to do the washing for the sick; from the fatigue and labor of his duty he was allowed, each day, an extra gill of whiskey, so that with this, together with that which he received from the charitable contribution of his friends and from other means, he was enabled to keep pretty uniformly in a state of intoxication, or in other words, comfortably drunk. His services, however, were not of long duration; he took the fever and died. A second, a third, and a fourth, who seve-

* Nonius De re Cibaria, lib. iv. cap. 15, p. 179.

rally succeeded each other in the capacity of washers, and who followed the example of their predecessors, shared the same fate, in the course of one season.* Whatever part of this misfortune was to be ascribed to contagion, the presumption is, that the principal mischief arose from intoxication.

It is scarcely necessary to observe, that water is the most wholesome drink that can be used during the summer season; its virtues, however, may be improved by the addition of vegetable acids. It was to the exclusive use of water as a beverage, that the great Dr. Haller owed the entire preservation of all his senses, and particularly of his sight, to a very advanced period of his life.

In the prosecution of the inquiry, the next subject that claims our attention as preventives, is the use of such remedies as evacuate morbified matter from the system, as issues, emetics, cathartics, &c.

The utility of issues in the prevention of fever in individuals, is a doctrine as old as the days of Hippocrates; besides whom we may mention among the advocates of this remedy, Pareus, Zacutus, Plateus, Galen, Lusitanus, Diemerbroeck, Fabricius, Lancisi, Hildanus, Senertus, Willis, Muller, Merculialis, Liutaud, Prosper Alpinus, Koempfer, &c. We are informed by Procopius, that during the prevalence of a destructive plague, those who had ulcers on any part of the body generally escaped the disease. It is said by Plateus, that in the plague which prevailed in Leyden in 1564, all who had issues remained uninfected. He gives an account of a certain monk, who went about establishing issues in persons as a preventive of the disorder, and who brought on a suppuration by introducing a piece of black hellebore into a wound made in the scrotum; and which, on account of its efficacy, was considered as a charm.

* Dr. Lind and Dr. Trotter ascribe the danger of washing for hospitals to infection or contagion, from the foul clothing. Dr. Lind observes, that the nurses of hospitals know well that there is most danger of catching fever, when they pile heaps of bed clothes or body linen together, for a few days, before it is carried to the wash-house. "The washer women at Haslar," says Dr. Trotter, "have told me that they know when any dangerous fever is in the hospital, from the bad smell of the clothes; this makes them air them abroad, till the smell is gone, and then they can wash them with safety. But if it happened from the hurry, that this could not be done, or if it was neglected by design, many of them have been seized with the sickness. The porters and people employed in cleaning and fumigating the blankets and beds at Haslar, are well acquainted with this fact, and they measure the danger by the badness of the smell." *Trot. Med. Naut. Vol. I. p.* 178.

Volney informs us, that the monks of Man Hannah El Chonair, in Syria, were much less affected with the disease of the country, than the peasantry amongst whom they lived: and they attributed this superior degree of health to an issue which they constantly kept running in one of their arms.

It is said by Dr. Jackson, in his account of the diseases which prevailed among the English troops in St. Domingo, that the healing of an ulcer was often followed by a fatal flux or a dangerous fever. "It is observed," says this author, "that persons subject to diarrhœa, from slight causes, generally escape serious attacks of fever. This seems to point out the propriety of opening the body freely by purgatives; as the knowledge of the fact, that ulcers of the legs and fever do not often exist in the same subject, seems to indicate that to open issues might be a means of preserving health." Baron Larrey found that none of those whose wounds were in a state of suppuration became affected with the plague. He also states, that the Europeans who are established in Egypt, and in Syria, preserve themselves from the plague, or, at least, suffer but little from it, by keeping setons or artificial drains constantly discharging.

The use of emetics and cathartics comes now to be considered as preventives of endemic fever.

There can be very little doubt that in cases of suppressed perspiration much of the excrementitious and morbific matters retained is determined to and carried off by the bowels. This appears from the sympathy established between them and the surface of the body. A copious and free perspiration relieves or puts a stop to a diarrhœa, and the latter is apt to take place from a check given to the perspiration.—We know that excrementitious fluids are often determined from their proper emunctories, and solicited to some vicarious outlet. We know especially that the bile is liable to great alterations, both in quality and quantity, as has been already pointed out; and as the bowels are the only natural channel by which this can be eliminated from the system, the necessity of effecting its expulsion in this way, becomes evident in all cases of redundancy of this fluid.—Though the proximate cause of fever does not consist in the quantity of biliary secretion, yet as the bile itself, under such circumstances, contains a considerable share of morbid poison, and by its accumulation would be disposed to increase the diseased condition of the circulating fluids, it is highly necessary that such accumulation should be prevented by the use of an emetic or cathartic upon occasion of any threatening symptoms of ill health. If the symptoms of fever have

not fully established themselves, a brisk cathartic will often be found sufficient to prevent the formation of disease. But if the indisposition be greater, an emetic should precede the cathartic. As an emetic, I commonly employ the tartarized antimony; dissolving about ten grains in half a pint of warm water, of which the patient (always supposing an adult) is directed to drink off about one third, and should that not operate sufficiently in fifteen or twenty minutes, a table spoonfull is to be repeated every ten or fifteen minutes till it has operated four or five times. In females and persons of delicate constitutions, white vitriol or ipecacuanha, or both combined, should be given in preference to the tartarized antimony.

Independent of any disagreeable feelings and premonitory symptoms of disease, the occasional use of cathartics in warm climates and unhealthy seasons will be found highly advantageous. As answering the place of more active medicine, I have been in the habit of prescribing the tincture of aloes and rhubarb, to which may be added some aromatics. This tincture taken every morning before breakfast, in such quantity as to produce one or two free evacuations in the course of twenty-four hours, I have found of singular benefit as a preventive during the summer season. Its preventive powers may be still further increased by the addition of a tea spoonful of Peruvian bark to each dose. Cream of tartar beverage, as answering the same purpose, is also an excellent remedy during the summer season. A citizen of Philadelphia asked the captain of a New-England ship, whom he met in Batavia, how he preserved the whole crew of his ship in health, while half the sailors of the other ships in the harbor were sick or dead? He informed him, that it was by giving each of them a gentle purge of sulphur every day.*

Those remedies and means which promote perspiration are also worthy of consideration. When we reflect upon the importance of the perspiration in the animal economy, it will readily be supposed that disorder must ensue from even a temporary suspension of this salutary evacuation.—The largest portion of the substances we consume, both as food and drink, is carried off by perspiration. But it is in summer, more especially, that the consequences of a suppression of the perspiration are to be apprehended. That which during the winter season would merely occasion a common cold, in which nothing more than the ordinary matter of perspiration would be retained, in the sickly months

* Rush's Inq. and Obs. Vol. IV. p. 193.

of summer and autumn, would prove the immediate occasion or exciting cause of fever. This arises from the circumstances previously mentioned, viz. from the fluids during the summer season, in unhealthy places, being constantly impregnated with the matter of fever, and requiring only a slight cause to excite it into action. Hence the necessity of the perspiration being kept up with constant uniformity. The inhabitants of Egypt have such a practical experience of the salutary effects of perspiration as a preservative of health, that the customary phrase of salutation amongst them is, *How do you sweat?* aware that the suppression of this discharge is the sure symptom of approaching disease. A free perspiration is one of the surest preservatives of health in hot and tropical climates. For this purpose, moderate exercise, so as to promote a free flow of perspirable fluid, is highly beneficial. It is in this way that persons who are employed in regular and constant labor enjoy better health and remain more exempt from disease than those who lead confined, sedentary, and inactive lives. And I have often had occasion to observe, that mechanics, upon resting from their employment for two or three days, have been suddenly attacked with fever. Dr. M'Lean* speaks in high terms of the salutary effects of exercise and perspiration; and informs us, that to a profusion of the perspiration, as the consequence of active exercise, he attributed his safety, amidst so much exhalation of miasmata, for so long a time. "I drank freely," says he, "of lemonade, sangaree, tamarind water, weak wine and water, and other diluent compositions; and when night came on, I was always prepared to enjoy my repose." To persons who are not compelled to pursue laborious employments, the cool of the day, either in the morning or towards sun-set, is the best time for exercise; and convalescents and invalids should avoid exposure to the sun; the heat of which is too oppressive and sickening for their debilitated constitutions.

For promoting perspiration, the moderate use of onions and garlic will be found serviceable during the summer season. The great exemption of the French and Spaniards in New-Orleans, Louisiana, and other places, from the bilious or yellow fever, is to be ascribed, in a great measure, to the free use of onions and garlic, their vegetable diet, and abstinence from spirituous liquors.

* Inquiry into the Nature and Causes of the great Mortality among the Troops in St. Domingo.

Most vegetables, indeed, possess the property of promoting the secretion both of urine and perspiration. Many people, particularly those who have derived their notions, by hereditary precept, from the antiquated doctrines of the medical school, are of opinion that vegetables are injurious during the summer, and that the diet, at this season, should consist principally of bread and bacon. From what has been said, it will readily be perceived that this is reversing the natural order of things, and acting in contradiction to the plainest indications of nature. In a healthy climate, it is not very material on what a person subsists, in case the food is not in itself absolutely unwholesome. Corn bread and bacon may here be indulged in *ad libitum*, provided sufficient exercise is taken, without producing any evil consequences. Grapes and melons are severely condemned by these rigid disciplinarians of the old school. It is true, that when, as generally happens after an attack of fever, the stomach is left in a debilitated condition, it would be imprudent and hurtful to load it with an overcharge of raw vegetables of any description. Such substances, from being difficult of digestion, and from producing irritation in the stomach and bowels, would endanger a relapse of the former complaint. But it is not altogether the quality of the food that should here fall under the ban of reprobation; it is the quantity eaten, and the excess to which the patient has indulged his appetite.

When persons, from feelings of indisposition, have reason to apprehend an attack of fever, a rigid abstinence, for a few days, or till the morbid symptoms disappear, will be found of the first importance in the prevention of fever and the restoration of health. The food that is used should be of the vegetable kind, and just sufficient to support nature without feeding the disease. By observing this rule, I have often known a threatened attack of fever prevented. "When there is reason to fear the approach of bad health," says Dr. Fordyce, "the best medicines are rest, abstinence, and watery drinks. By such, even violent diseases, when at hand, may be dispersed. Abstinence will never disappoint us, says Galen."—"In summer," observes Dr. Fordyce, "we should eat less, and drink more." (*not whiskey or spirits.*) "In autumn, we should avoid fish, and every species of food that promotes putrefaction, and live chiefly on fruits that will dissolve and carry off the bile."*

* Fordyce on Putrid Inflam. Fever, p. 89 & 20.

Dr. Trotter, speaking of the diseases of unhealthy climates, observes, "The use of spirituous liquors in any form should be totally laid aside; they are slow poisons in cold countries, but here they do the work of destruction quickly." * * "Among my own acquaintances who have returned in perfect health, I can reckon many, who lived almost on vegetables, and drank water."*

It was owing to their light and abstemious diet, that Socrates in Athens, and Justinian in Constantinople, were preserved from the plague with which those cities were afflicted.

The drinks in warm climates should be those of the cooling, watery, attenuating kinds; and as these qualities are possessed in an eminent degree by water, we can scarcely be at a loss for the most salutary beverage. To render this the more pleasant and even wholesome, molasses, vinegar, lime juice, tamarinds, cream of tartar, or a little wine may be added. But that description of hydrophobia, which substitutes whiskey and other spirituous liquors for the pure water of the fountain, has caused more deaths by far than ever was occasioned by the canine madness. A mad dog is an object of general persecution, against whom it is justifiable to employ clubs, guns, and missiles of every description: but more dangerous and pestilential to the community is a drunkard; an affliction to his family, a scandal to himself, a bane and contagion to society, and a disgrace to human nature. Spruce beer is also a wholesome drink during the summer season, and from its acidulous, diaphoretic and diuretic properties, is well calculated to act as an anti-miasmatic and preventive of fever. For the same purpose, tar-water has likewise been used with considerable advantage as a constant drink in unhealthy seasons and situations.

During the sickly season, the moderate use of tonics will be found beneficial as preventives. Of this class, the Peruvian bark may be considered as the most serviceable. Its efficacy in this way is highly extolled by a variety of authors, not only as a security against the fever and ague, but also against that more aggravated degree of bilious endemic called the yellow fever. This remedy is the more necessary in persons of debilitated habits, especially in those where a predisposition has been established by previous disease.

It is remarked by Dr. Blane, that men have been sometimes seized with the fever after they have been at sea more than a week; and that as a preventive, nothing is more ad-

* Medecina Nautica, Vol. I. p. 345.

visable than to take some doses of bark, after cleansing the bowels by a purgative.* Dr. La Fuente used bark for the prevention and cure of the yellow fever.† Dr. Lind considers the bark as the best preservative from contagious fevers, and to prevent a relapse, by being early exhibited after its recess.‡ Huxham found the bark and snake root answer the same purpose in hospital fever. Mr. Robertson gives us a striking instance of the preserving efficacy of the bark, in an account of a voyage in the ship Rainbow to the coast of Africa. By the use of this remedy, Count Bonneval and his suit remained uninfected in the camps in Hungary, whilst half the army were destroyed by fever. As a preventive, two or three tea-spoonfuls may be taken daily.

The cold bath will also be found a useful remedy in the prevention of fever both in children and adults. By cold bathing, is not meant the idle and unwholesome practice of remaining in the water half an hour at a time; but the transient application of this element to the body frequently, as well for cleanliness, as for the purpose of imparting tone and vigor to the system. The best time for the employment of this remedy is in the morning, whilst the circulation is most vigorous, and the reaction strongest. I should consider myself happy, could I prevail upon that portion of the community whom the romantic fancies of enraptured lovers have often exalted to the deified distinction of angelic excellence and perfection; could I prevail upon them to consider cleanliness as a moral and religious duty. But alas! how often does it happen that a fair exterior, like a whited sepulchre, is but a mockery of the senses, the cloak and covering of impurity. They, whose flowing garments are so admirably constructed to gather to their persons the flying particles of the dusty streets, seem frequently to possess the natural antipathy of sheep to water. Not so with the French; neat and cleanly in their persons, water is their favorite element: and a French lady would as soon think of putting on a dirty garment to grace a party, or a ball room, as to appear in company or in public with an uncleanly and an unwashed person. Let our fair-faced citizens imitate their wholesome and virtuous example. The experiment will delight and surprise them; it will give them a better opinion of themselves, and render them more amiable and lovely in the eyes of their companions; it will preserve their

* Med. & Phys. Jour. Vol. XIV. p. 531.
† Lind on the Diseases of Seamen, p. 107.
‡ Blane on the Dis. of Seamen, p. 231.

youth, health, sweetness and complexion, better than all the cosmetics and lotions of the shops, or than all the balms, spices, and fragrance of Arabia. Every family in hot climates should have a bathing apartment to their dwellings, to which they should daily resort for cleanliness and health, with as much regularity as the exemplary and pious christian to his closet and devotions.

Many persons are of opinion that wearing flannel next to the skin in the summer season, as it promotes perspiration and protects against the vicissitudes of the weather, is serviceable as a preventive of disease. In more northerly and colder climates this may apply; but in the southern states I have generally remarked that except in thin, cold, withered, and phlegmatic habits, the use of flannel was injurious: inasmuch as it stimulates too highly and produces too profuse a perspiration, thereby inducing a hurtful degree of debility and relaxation. Cotton shirting, being less heating than flannel, and not so apt to give a sudden check to the perspiration as linen, by transitions from exercise to rest, appears to be better adapted to the southern climate.

Mercury has by some been considered as a preventive of fevers. Its efficacy, however, in this respect, upon careful investigation, appears to be very doubtful; for although it possesses the power of evacuating bile, it seems also to favor and promote its generation. M. Pugnet, who accompanied the French army as physician in Egypt, did not find mercury of any benefit as a preventive of the plague. And Dr. Robertson, in his View of the Natural History of the Atmosphere and Epidemical Diseases, observes, that he has seen soldiers and others fully impregnated with mercury, for the cure of *lues venerea*, attacked with typhus contagion, which in every instance seemed thereby to be rendered more severe.* It was remarked by Dr. Hunter, that mercury had no effect upon the constitution to render it less susceptible of fever.† "In warm climates," says Dr. Adams, "we see the effects of this mineral (mercury) most obviously. If exhibited to a constitution whilst there is a crude wound, we find it eating as a poison, that is, producing ulceration beyond what is necessary for dislodging the dead edges of a cut."‡

Dr. James Clark, in his account of the yellow fever of St. Domingo, assures us that the officers of *His Majesty's* navy

* Robertson on the Atmosphere, &c. Vol. II. p. 384.
† Hunter on the Diseases of Jamaica, p. 287.
‡ Adams on Morbid Poisons, p. 118.

and army, who have leisure and can be prevailed upon to undergo, on their arrival, one or two gentle courses of mercury, taking after each a few laxative medicines, confining themselves to the moderate use of wine, and living chiefly on vegetables and fruits, for the two first months, may rely almost to a certainty on escaping the fever.* Omitting the mercury, no exceptions can be taken to the above advice.

Fever is sometimes so sudden in its approach as to afford but little warning. In many cases, however, it is preceded for a day or two, or even for a longer period, by various premonitory symptoms, which by a person who has experienced them are more easily understood than described.—The person either loses his appetite or experiences unusual voracity; the stomach and bowels are more or less distended and affected with sickness and oppression, costiveness, flatulence, and colic. The invalid perceives a bitter taste in his mouth, and finds his tongue in the morning covered with a whitish or yellowish fur, and sometimes belches a mouthful or two of bile from the stomach; the evacuations by stool are either light, hard and clay coloured, or yellow, green or dark, and froth and foam like yeast. The patient loses his appetite for solid food, and is disgusted with the sight and smell of the viands of the table; he experiences a general sensation of languor and debility, and finds motion and exercise fatiguing and unpleasant. The mind is no longer capable of close and continued attention to any subject of reading or reflection. The eyes are stiff and painful in their movements; and pain, languor and fatigue affect the larger muscles of the extremities. The invalid experiences more or less of a head-ache, which is increased on motion, or by looking upwards; his pulse is frequent, small and weak, or frequent, full and tense; the urine is high coloured, and the skin dry and preternaturally warm. He is affected with unusual drowsiness, or want of sleep. When a person is affected with many or all of these symptoms during the prevalence of an endemic fever, he may calculate that in the uninterrupted course of the disorder the full developement of fever is not far distant; in order, therefore, to prevent its formation, he should abstain almost entirely from food of every description for a day or two, or till the symptoms of indisposition have disappeared. If this should not be found sufficient, an emetic or cathartic, or both, become necessary.

* Duncan's An. of Med. Vol. II. p. 169.

We are informed that Sydenham cured, or rather prevented the formation of disease in his children and intimate friends, in the continued fevers of 1673, 1674, and 1675, by directing diluents and prohibiting every kind of aliment, and in this way making them fast strictly for two or three days.

During the prevalence of an endemic fever, persons cannot be too careful in attending to the first admonitions of disease. Indisposition, though slight at first, will, if neglected, soon terminate in confirmed illness; painful affections of parts which have often been diseased, may be looked upon as ominous, for if there is one part of the system weaker than another, the causes of fever will first exert their morbid influence upon it. At such times, what at first was nothing more than an intermittent, after a repetition of two or three paroxysms will degenerate into a malignant bilious remittent.

SECTION II.

Of Local Remedies as Preventives of Endemic Fever.

From what has been observed, when speaking of the causes of fever, it will readily occur that vegetation must be a powerful means of preventing the deleterious effects of the noxious matters evolved during the process of animal and vegetable decomposition. This the general experience of mankind confirms. And, accordingly, in all parts of the United States, at least as far as my information and observation extend, it has generally been found that for the first year or two after settlements have been made, the country remains healthy; until, by the process of clearing, the timber and vegetable growth become so much diminished that the redundancy of miasmatic exhalations, or in other words, the excess of unappropriated decomposing vegetable matter, becomes injurious to health and gives rise to disease.—This condition of the country continues for one or two years, when, from the decomposition of the newly turned up vegetable mould, the noxious matters having been diminished, and the luxuriant crops of corn and cotton having in some degree exhausted the exuberant fertility, disease sensibly declines. The mode of clearing in the southern states, also favors the effects of decomposition; the large trees being merely killed, and not cut down and destroyed, are left to

rot and moulder, piece-meal, on the ground. This circumstance, however, bears no proportion to the miasmatic exhalations from the newly turned up soil: for in the western part of the state of New York, where the soil is extremely fertile, and in other parts of the northern states of like description, where they are in the habit of cutting down and burning all the timber, and converting it into potash, they have been also subject, for the first few years subsequent to the clearing, to violent epidemics of bilious or yellow fever.

This circumstance, in part at least, has been strikingly exemplified in various parts of Alabama, where, in many instances, the inhabitants for the first two or three years enjoyed uninterrupted health; then again, for two or three subsequent years, fevers and fluxes have made their appearance in the summer season.

From the known efficacy which the growth of plants possesses of preventing the hurtful effects of decomposition in the mouldering mass of extinct vegetation, an important lesson is presented to our consideration: that in the construction of towns in a newly settled country, care should be taken to preserve the trees and vegetable growth in its precincts and vicinity, except so far as the opening of the streets and the erection of buildings may require their removal. Trees should also be planted along the side-walks of the streets, at regular and proper distances; which will possess a three fold benefit, as it respects ornament, comfort and health.—It is owing to an ignorance of this important fact in the economy of nature, that people so far mistake the means of contributing to their own health and comfort, as to consider it the first and most necessary step in the settlement of a town to remove every tree and bush from the limits of its enclosure; thus committing wanton havoc and destruction among the preservatives of health, and making an inroad for disease and death. Should there be any marshes or low grounds in the vicinity of a town, in addition to ditching and draining, all the trees by which they are filled and surrounded should be suffered to flourish, and their growth should rather be encouraged than diminished. The denser the shade and the more luxuriant the vegetation in any situation, the less will be the danger from unhealthy exhalations.

Lancissi was not the first who had remarked the salutary effects of the planting of forests, and the growth of vegetation, in restoring salubrity to the atmosphere. The same observation was made by the earlier investigaters of physical science. Changeux, a respectable physician, remarks, that the custom is very ancient in Asia, particularly among

the Persians, who for this purpose cultivate trees, particularly plantains, both in the environs and in the midst of their cities.*

We are informed by Farquahar, in his account of the climate of Jamaica, that in the low lands of that island, particularly between Kingston and Spanish-Town, there are many swamps and lagoons which form ample sources of disease; the vicinities of these places are, however, more or less sickly, as they are or are not clear of wood. In the middle of the island, where there are large swampy tracts of land covered with high woods, the endemic is seldom known.—As an evidence of this fact, there is a district, known by the name of Sandy River, situated in the most remote part of the parish of Clarendon, and adjoining St. Ann's, where several very productive coffee plantations have been, during the last ten years, established, and where, in the space of a mile, five or six white families, with several hundred negroes, reside; and although contiguous to these plantations there are large tracts of swampy land to the extent of some miles, yet, as they are covered with high woods, and consequently sheltered from the action of the sun, both the whites and negroes in the vicinity, enjoy the most uninterrupted state of health.† From which the writer draws the following conclusion, "that for swamps to constitute the source of disease, they must be previously acted on by heat." The reader will perceive, from what has already been said, that this explanation is incomplete and defective.

Lancisi quotes many former writers, in recommendation of the salutary effects of woods, when situated between marshes, and towns, villas, camps, &c.; and also gives us many striking examples of the deleterious effects from the destruction of forests in such situations.

There can be no doubt that, independent of any other operation and effect which they possess, trees and growing vegetables of all kinds have a very considerable influence in cooling the atmosphere, not only in their immediate vicinity, but for some distance around. Every person must have been made sensible of this fact, from remarking the change of temperature in passing from a town, or place unshaded by trees, to the neighborhood or covert of a wood. The rays of the sun, being obstructed by the leaves and branches of the trees, their heat is expended, to a considerable degree, among the foliage, and is absorbed by the evaporation or vegetable

* Journal de Physique de l'Abbe Rosier, tom. xxiii.

† Farquahar's Act. of the Clim. of Jama. Phil. Med. Mus. Vol. I. p. 177.

perspiration which is constantly taking place, in hot sunny weather, from every leaf that trembles in the breeze. Some idea may be formed of the power of evaporation in cooling the atmosphere, when it is understood that water, on being converted into vapor, combines with more than five times the quantity of caloric that is required to bring ice cold water to a boiling heat, and occupies a space eight hundred times greater than it does when in the form of water.* It appears to be owing to the great diminution of evaporation from the surface of the earth, that a long continuance of drought in the summer is generally attended with very hot weather.

We come now to another part of the subject in the prevention of fever, which, although like other innovations and discoveries, it has been disputed, as combating with the favorite hypotheses and speculations of certain physicians; yet the number and accuracy of the experiments, repeated by distinguished and scientific gentlemen, who could not be suspected of gross prevarication, or of wilful and interested imposition, must convince the unprejudiced of their correctness and truth. I allude to the destruction of noxious miasms or infection by acids in a state of vapor, or, in other words, by acid fumigations. The efficacy of these fumigations is now generally admitted among chemists, as well as scientific physicians.

The power of mineral acids in destroying infection. was known to Sir John Pringle as early as 1750. And in 1758, Dr. Johnson published a pamphlet, in which he sets forth the efficacy of the vapor of the muriatic acid in destroying the infection of a malignant fever which raged at Kidderminster in 1756. During the prevalence of a dreadful epidemic at Seville, in 1800, in which more than twelve thousand persons perished, Mr. Queralto, one of the surviving commissioners appointed by the Spanish government to try the effects of the nitrous vapors, reported that the success exceeded the most sanguine expectations; as the progress

* Dr. Black heated a quantity of water in a strong phial, closely corked, till its temperature rose ten degrees above 212°, its usual boiling point. On drawing the cork quickly, a small portion of water rushed out in vapor, and the temperature of the remaining fluid sunk instantly to 212. Ten degrees of caloric, therefore, had been absorbed by the quantity of vapor that escaped. Mr. Watt, by heating water under the pressure of a strong iron vessel, raised its temperature to 400°; yet still, when the pressure was removed, only part of the water was converted into vapor, and the temperature of this vapor, as well as that of the remaining fluid, was no more than 212; there were, therefore, 188° of caloric absorbed in an instant, by the formation of the vapor, which had no effect on the thermometer.

of the contagion was not only stopped from the day after nitrous fumigations were adopted, but no patient was afterwards attacked by the fever in any part of the hospital.—We are further told that the fumigations proved also an excellent medicine to the patients; for all who lay in the wards where the fumigations were continued day and night, found instant relief, and most of them recovered within a few days. Instead of twelve persons dying every day in the hospital, as usual, before the employment of the nitrous vapors, the number decreased soon after to only one in a day.*

But the person who has made the most extensive observation upon this subject, and who may be considered as having essentially contributed to a new and valuable discovery in medical science, is Guiton Morveau.† M. Morveau's theory of fumigation had for its basis two well known facts: 1st, that all putrid decompositions produce a great quantity of ammoniac; the 2d, that the muriatic acid and ammoniac, when they meet each other in a state of vapor, or gas, form, almost instantaneously, a neutral salt. The same thing is true with respect to the nitrous acid gas; and although we are not authorized to say that ammonia is, itself, the principle of infection, yet we have every reason to conclude that the matter of infection is of an alkaline nature.‡ In rela-

* Med. and Phys. Jour. Vol. II. p. 136.

† See his Treatise on the Means of Purifying Infected Air, of Preventing Contagion and Arresting its Progress. Mr. Brande, in his Third Dissertation on the Progress of Chemical Philosophy, pays a handsome compliment to Mr. Morveau. Speaking of this distinguished philosopher, he observes, that "amidst various avocations, he prosecuted chemistry with successful diligence, and, had he given nothing else to science, his name deserves to be transmitted to posterity, as the inventor of the means of destroying infection by acid vapors, the efficacy of which he first pointed out in the year 1773."

‡ When it is intended to purify the air in the wards of a hospital, or of an infected apartment, a chafing-dish or iron vessel of coals is used, and in it is placed an iron pot half filled with sand or ashes. On this sand bath must be placed a glass vessel containing common salt, (mur. sod.) and when the salt begins to be heated, sulphuric acid is to be poured upon it, after which the doors and windows of the ward must be kept as closely shut as possible, for seven or eight hours. In other instances, says M. Guiton Morveau, several small vessels should be carried about the apartment, adding a small quantity of acid at a time. This is the ordinary mode of disinfection, by means of the muriatic acid gas.

The oxygenated muriatic acid gas is still more powerful, and is prepared as follows:

	oz.	*drs.*	*grs.*
R. Common salt, - -	3	2	10
Black oxyde of manganese,	,,	5	17
Water, - - -	1	2	33
Sulphuric acid, - -	1	7	50

To which heat is to be applied, as above directed.

tion to the power of disinfection by means of acid fumigations, it is related by Mr. Morveau, that the next day after fumigating a church, which had been filled with offensive and putrid effluvia, upon throwing open a door for the admission of fresh air, not the slightest degree of any offensive odour remained; and all who were present went away convinced that the infection was completely exterminated.—Four days after, service was performed in it as usual, without any inconvenience being experienced. Numerous other experiments in purifying offensive and infected places, were made by the same author. Similar experiments and observations have likewise been made by Smith, Brothwaite, Patterson, Bonvoisin, Martigni and others. And that this property which the muriatic gas possesses, does not consist in merely masking the disagreeable odours of infected places, they remarked that aromatics and other odorous substances, although they corrected, for a time, the disagreeable smell, yet had no effect in destroying the contagion.

M. Morveau infers that oxygen, and particularly the gaseous oxyginates, produce two effects of the same tendency. They exert on the contagious miasmata an affinity which decomposes them; and they aid the living human body in resisting that power of assimilation, which renders contagion dangerous after it is introduced. According to the experiments of M. Morveau, aromatic vinegar, acetic acid, and pyroligneous acid, (*acid of smoke*,) possess the power of destroying putrid odours in a very considerable degree, though inferior to the muriatic acid gas.*

The respirability and diffusive property of the muriatic acid gas, says Morveau, give it an advantage over the nitrous gas. He considers nitrous gas exceptionable, not only from its being liable to impurities, but by robbing the air of a portion of its oxygen. He thinks the oxygenated muriatic acid gas the best anticontagious substance with which we are acquainted; and may be breathed without the least inconvenience.

The alkaline quality of the matter of infection would further appear from the following fact. Morveau found that when he submitted his reagents to the fumes disengaged by lime from the water which he had used in displacing the infected air, and which coming into immediate contact with the putrid flesh, had acquired a slightly reddish tinge; at the end of two hours, the slips of paper covered with the fur-

* Experiment XVI. and XXV.

num bucca, the mallows, and even the turmeric, gave unequivocal signs of ammoniacal gas.*

That quick lime possesses no power of disinfection, appears from this, that according to the experiments of M. Morveau, corrupted air possesses its noxious smell even after being agitated with lime water.

When the doctrine of Septon was in vogue, its abettors attempted to prove that the deleterious property of morbific effluvia, consisted in an acid, which they called *septic acid*, (from the Greek *sepo*, to putrefy,) because it was the result of putrefaction; formed by the combination of nitrogen with oxygen, previous to their taking upon themselves the gaseous state. From which it appears that septic acid and nitric acid are one and the same thing.† As this hypothesis stands in opposition to direct experiment, it may consequently be considered as gratuitous and unfounded.

* Morveau's Experiments, p. 78.

† No disrespect is intended towards Dr. Mitchell, to whom the world is indebted for this doctrine, by any observations which may be made in relation to it; his character as a man of science stands deservedly high, and his immense stock of reputation can sustain but little diminution, even by the loss of a favorite hypothesis. The Doctor calls azotic air, or nitrogen gas, by the name of *septous gas;* dephlogisticated nitrous air, *gaseous oxyd of septon;* nitrous air, *septic gas;* nitrous acid, *septous acid;* nitric acid, *septic acid*, &c. &c. Several of the ancients were of opinion that the poisonous exhalation from marshes was composed of minute animals, which being set afloat in the atmosphere were received into the body by the mouth and nostrils, or insinuated themselves by the surface. I shall notice a few of these singular opinions, as quoted by Lancisi, in his treatise *on the noxious steams from marshes.* Among the Latins, we read that M. Varro speculated on this subject, and ascribed the mischief to swarms of insects. "It is worthy of remark," he writes, "in marshy places, that as they dry up, there are produced certain very small animals, too minute for observation by the eye; which being taken into the body by the mouth and nostrils, are the cause of difficult diseases." The ground-work of this opinion, (says Lancisi,) seems to have been laid by Lucretius, where he sings of physical truths in poetic strains; "all bodies are liable to putrefaction; and animated insects spring from that corruption." Not unlike the opinion of Varro, was that of Columella; who writes, "That a marsh ought not to be in the neighborhood of buildings, nor near a military way, because, when acted upon by heat, it ejects a baleful poison, and engenders animals armed with troublesome stings, which settle upon us in the thickest swarms. Then, too, it emits the venomous hosts of water snakes and serpents, freed from their winter's slime, mud, and fermentative colluvies. And from these arise frequent obscure diseases, whose causes have not been investigated even by physicians." Palladio has expressed himself in nearly the same terms, where he says, "A marsh is to be avoided upon every principle, especially on the south or west, or if it usually dries up in summer; because it generates pestilence and hostile animals." Athanasius Kircher, in his scrutiny of the plague, renewed the opinion of Varro: and when he recounts the causes of this woful malady, he mentions septic exhalations breathing from those places which abound with the filthy mud of marshes and pools. He affirms that these vapors are nothing more than certain aerial particles of a

It has already been remarked, that lime water possesses no power in destroying infection, or putrid smells, which it should do, according to the doctrine of septic acid. The quality of lime in resisting putrefaction, is a property which it possesses in common with many other earthy and mineral substances, which, however, form no chemical combinations with the decomposing matter.

Not only are the mineral acids correctors of noxious miasmata, but various other morbid poisons are also destroyed by them. Thus the nitrous vapor has been found an excellent and effectual remedy in cases of obstinate ulcers.* Variolous and vaccine matter, exposed but for a moment to the vapors of oxygenated muriatic acid, lose their contagious properties.† Halle, in 1787, conjointly with Fourcroy, made trial of the oxygenated muriatic acid in the case of a woman attacked by a large cancer in the breast. Though a cure was not accomplished, yet the simple application of clothes dipt in the acid produced a remarkable change; the fœtor was diminished, the colour improved, and the discharge became less sanious.‡ Mr. Cruickshank tried to inoculate two subjects with a portion of the variolous poison, after mixing it with the oxygenated muriatic acid: the insertion produced no effect, whilst the other portion communicated the variolous eruption.§ M. Halle found that from the internal use of the oxygenated muriatic acid, prepared with the oxyde of manganese, hectic fever was suspended in a patient sinking under pulmonary consumption, and that she died without diarrhœa. Mr. David Patterson, on the nitrous vapor as a means of purifying infected places, observes, that the nitrous vapor, with due attention to cleanliness, ventilation, changing the wards, &c. is seemingly the remedy, the best calculated for preventing, or speedily destroying contagion. He also found it efficacious in cases of obstinate ulcers.‖ Dr. Bonvoisin found that the acetic acid acted as a preventive in putrid malignant, pestilen-

mixt, of the same property and nature with the whole; that they are destitute of life, but soon change to innumerable insensible worms; so that as many corpuscules as there are in the effluvia, as many vermicules will be hatched from them. These animated effluvia emit the more dangerous poison, in proportion to the greater vigor and energy they possess."

* Patterson on the Nitrous Vapour, as a means of purifying infected places. Duncân's An. Med Vol. III. p. 410.

† Brothwaite on Scarlet Fever. Med. Jour. Vol. IV.

‡ Ann. de Chem tom. xxvi.

§ Ibid, tom. xxviii.

‖ Dunc. An. Med. Vol. III. p. 410.

tial maladies, when its fumes were inhaled by the organs of smell.*

It is also upon chemical principles that we are to account for the salutary effects of the smoke of common fires, as a preventive of fevers in unhealthy situations. It is well known that one of the results of combustion is the pyroligneous acid, which, by combining with the noxious miasms, destroys their infectious property. "It is not to be doubted," says Dr. Lind, "that excepting the true plague, there has been an infection fully as pestilential and as mortal, in some ships as in any other places whatever; yet I never heard of any ship, which, after having been carefully and properly smoked, did not immediately become healthy."† The same author informs us, that when the fever was so mortal in the Royal Ann, a guard-ship at Spithead, that many died of it in forty-eight hours illness, with profuse bleedings from the nose, it was remarked that none who slept within reach of the smoke from the cook room were infected.‡ He further remarks, that the contagion of the small pox has been entirely stopped by means of wood fires, sprinkled with brimstone kept burning and closely confined in the infected place.§ It is well known that the combustion of sulphur, in the atmospheric air, produces the sulphurous acid gas, distinguished by its pungent and suffocating odour; and from what has already been said with respect to acid fumigations, it will readily be perceived that the burning of sulphur or brimstone operates in the same chemical way in destroying infection.

The remarkable exemption of the steam-ship Robert Fulton from sickness, notwithstanding her frequent passages to and from New-Orleans, Havana and New-York, is to be ascribed principally to the smoke, or the *pyroligneous acid.* The unusual healthiness of the crew of Captain Cook in the bark Endeavour, in his voyage round the world, may be brought in as another instance of the salutary effects of smoke in the prevention of disease. During this voyage through various latitudes, both of the frigid and the torrid zones, out of a company of more than one hundred and twenty persons, and during a three years' cruise, there were only four deaths, three of which were from accidents, and

* Memoirs of the Academy of Turin, quoted by Morveau, on Disinfection, p. 8.

† Lind on Fever and Infection, p. 44.

‡ Ibid, p. 49.

§ Ibid, p. 48.

the other from consumption of the lungs. It was the frequent practice of Captain Cook, to kindle a fire in the well, at the bottom of the hold. In this way, upon closing the hatches, the smoke penetrated every part of the hold of the vessel, and the foul air being at the same time rarified by the heat, was in a great degree expelled, while that which remained was purified by the acid of the smoke, or the pyroligneous acid.

The known efficacy of the mineral acid gases, and particularly of the muriatic and oxygenated muriatic acid gases in destroying infection, and the local and limited origin and extent of this matter in the fevers which prevail on ship-board, offer a valuable remedy to our navy in cases of malignant and fatal diseases arising from cruises in hot climates; and there can be no question that had this remedy been resorted to on board the Macedonian frigate in the summer of 1822, the greatest part of the mortality which took place in that vessel would have been prevented. But new discoveries and improvements, however valuable, are slow in gaining credit. Attachment to former customs and the prevailing prejudice of opinion oppose no inconsiderable barrier to the progress of science and the dissemination of truth. The power which these acid gases possess of destroying infection, points them out as the most suitable and powerful agents in the purification of infected goods and apartments. Where the infectious miasms are of limited extent, as in hospitals, or on ship-board, their application is as easy as their operation is effectual. Vessels, from cruising in tropical climates, often engender in the corruptible contents of their holds, as offensive bilge water and a perishable cargo, the principles of malignant, bilious, or yellow fever. Next to removing the corrupting materials of disease, which is often a matter of difficulty and labor, nothing can be employed with so much immediate benefit as the muriatic acid gas, which by neutralizing and destroying the infectious miasms as they arise, prevents their deleterious and morbific effects. Where goods are suspected of containing the matter of contagion, a free exposure to the open air is sufficient for their purification; for, as has already been remarked, infection loses its virulence in proportion to its dilution and diffusion.

From the limited extent of infectious miasmata, a means is suggested of avoiding their influence, by removing, when practicable, beyond the sphere of their operation. Thus it has been found, in various instances, that ships lying at the distance of a few cable lengths from the unhealthy

shore, is a sufficient protection against disease. So, by removing to a healthy inland situation, although but a short distance from the seat of infection, will be sufficient to escape disease. Or if persons, immediately upon being seized, are removed to a healthy place, the danger of the disorder is in a great measure obviated. Thus we are informed by Dr. Lind, that when the Lion, Spence, and several other ships of war, were employed at Port Antonio, in the island of Jamaica, in clearing the navy island of wood, in order to build wharves and store-houses in that place, many of the men, when cutting down the wood, were seized at once with a fever and delirium. This frenzy attacked a man so suddenly, and with so much fury, that with his hatchet, if not prevented, he would have cut to pieces the persons that stood near him. By bleeding and sending them on board of their respective ships, they all quickly recovered.*

Persons who reside in, or remove to, the dry and hilly parts of the West India islands, escape the endemic which may prevail in other parts of the island. Dr. Lind speaks of the healthiness of hilly situations in the West Indies and other countries, and the exemption of the French neutrals who were removed in 1756 from Nova Scotia, while they remained on Monk's Hill, in Antigua, although a great mortality raged in the rest of the island, particularly among the English, who were dying rapidly with the yellow fever and flux.† For instances in support of this fact, however, we need not travel far, since in our country it is universally found that the only healthy situations are those at a distance from low grounds, ponds, marshes and water courses, where the land is broken and hilly, or poor and sandy. And we frequently have occasion to observe the endemic fever prevailing with the utmost malignity on the rivers and low grounds, whilst at the distance of two or three miles, where the country is dry, hilly and poor, the inhabitants are perfectly healthy.

Every family in a town or city should be particularly attentive to the means of health in their own premises and vicinity. A proper descent and drain should be given to all the water that may fall upon their lots, and not a particle should be left to stagnate and putrefy in sink holes and puddles; all places below the general level should be filled up with sand or gravel; and the back yards should be raised with earth and sand, so as to give a sufficient descent into

* Lind on the Diseases incidental to Europeans in Hot Climates, p. 126.
† Ibid, p. 217.

the adjoining street. If the streets themselves are too level for the water to drain and flow from them with facility, this natural want of unevenness of surface should be supplied by art; the streets should be ridged up in the middle by drawing the dirt from both sides, and the side walks should be raised with sand and gravel, and paved with brick or stone, where this is practicable. The drains should all be sufficient to allow an easy flow to the water without suffering any stagnation.

The proper season for draining stagnant ponds, is in the winter. If this is deferred to the summer, it had better be omitted altogether; for the action of the sun and air upon the corruptible materials left upon the surface of the earth from which the water has been recently drained or dried up, produces exhalations highly virulent and pestilential. This fact was illustrated, chap. 1, pages 47 and 48, under the head of Miasmatic Exhalations; where it was also shown, that overflowing offensive matters in such situations with fresh water, prevented or suspended the extrication of miasmata, and put a stop to the prevalence of disease.

The limited sphere of miasmata puts it in the power of human care and industry to guard against and prevent, in a limited degree, their generation and influence: and if, as we all know, noxious miasms prove deleterious to life in proportion to their strength and the vicinity to their source, the necessity of removing all nuisances within the precincts of our towns and individual habitations, must be too evident to require further illustration. It was from the wise counsels of Lancissi, that philosophic physician, that Rome, once the nursery of disease, was freed and preserved from the desolating visitations of the plague: the ponds and marshes in its vicinity were drained, and cleanliness was enforced in the city. It was from a similar attention to, and improvement of their police, that London was protected against the visitations of those pestilential diseases to which she had been frequently subject. If cities once obnoxious to such desolating calamities, can, by the prudence and industry of its inhabitants, be made perfectly healthy, what may we not expect from the same spirit and liberality in the improvements of places, now the scourge and terror of the people? Nature is every where governed by similar laws, and the physical causes of health and disease are subject to the same operations. Man has been constituted by his Maker the lord and master of this terraqueous globe; and to him it was granted to make such alterations and improvements upon its rough hewn and disfigured surface, as might be most condu-

cive to his happiness and enjoyment. In this way, by not being left the mere victim of sloth and sensuality, he becomes indebted to his labor for his welfare, and is yet sufficiently beholden to the Providence that rules the seasons to be sensible of his obligation and dependence.

CHAPTER XIV.

OF THE CURE OF FEVER.

Preliminary Remarks.

As I shall hereafter treat more particularly of the endemic fevers of Alabama, in this place I shall only make such observations on the cure of fever as may be of general practical application to all endemic fevers of the southern states. In a practical point of view, this step will seem the more necessary, as in the account of any particular epidemic there are peculiarities of treatment which do not demand that systematic detail and discrimination of circumstances required in delineating the treatment of endemics in general.

The close connexion that exists between intermitting and remitting bilious fever, will render it necessary to make a few remarks in relation to the former, previously to entering upon the more particular treatment of the bilious remittent.

SECTION I.

Of the Cure of Intermitting Fever.

In this fever, the object is to moderate the paroxysm when present, and, when absent, to prevent its return.

If called during the paroxysm of a fever and ague to a patient of robust and full habit, in whom the febrile action

runs high, it will be proper to have recourse to venisection. The loss of twelve, or sixteen, or twenty ounces of blood, will generally afford instant relief to the patient. If the symptoms should not be such as to require the use of the lancet, the cure may be commenced by premising an emetic, in the manner directed under the head of *Prevention;* and in most cases this should follow the bleeding.

In the intermitting fever, there is less danger from the exhibition of emetics than in the higher grades of bilious fever; the prostration which sometimes follows the use of an emetic in the latter, need not be apprehended in the fever and ague; in which I have sometimes found it necessary to exhibit twenty or thirty grains of tartarized antimony before a sufficient operation could be excited. But the same quantity given in the bilious remittent, though not operating severely, would, in many instances, be followed by an alarming and perhaps fatal prostration of the system.

Tartar emetic, given in divided doses, shortens the paroxysm, by accelerating the flow of perspiration; and when it has ceased to operate as an emetic, it often acts as a cathartic. Warm drinks should be given freely during the operation of the emetic, and thin gruel or weak tea of almost any description during that of the cathartic.*

* We find the utility of the emetics and the tartarized antimony as a remedy in fever and ague strongly insisted upon by a variety of authors. We are informed by Galen, that many were cured by this remedy alone. In all cases, says Celsus, when the febrile paroxysm is introduced by a coldness and shivering, vomiting is necessary. The utility of emetics is also strongly insisted upon by Paulus Ætius. And amongst others of a more modern date, Riverius speaks in the highest terms of their efficacy, considering them more certain and useful than any other remedy. As connected with this subject, Etmuller makes the following observations. "If pain of the stomach accompanies fever, nothing equals antimonial vomits, which prevent an infinity of dismal consequences. After vomiting, purges are proper; but by reason of their offensiveness to the stomach, let 'em be mixed with opiates; a useful contrivance for such as are liable to griping, or over purgations, or stuffed with sharp, scorbutic, hypochondriacal humors." Senac also gives testimony to the efficacy of emetics. "Emetic medicines," says he, "are, indeed, so efficacious in intermittents that they often times bring them to a close as it were by a single blow. Many practitioners in marshy countries err in this, that they place too little dependance on emetics. Such is the efficacy of these remedies against fevers, that I have used them as prophylactics, to escape an attack." "Nothing is more proper," says Huxham, "to eradicate intermittent fevers than frequent vomiting. The Romans of old vomited themselves out of mere luxury, that they might eat the more heartily: why should we not therefore do it for the sake of health." *Huxham on Fever, Vol. I. p.* 28.

It was observed by Fontana, that the dogs and cats which he had poisoned recovered with a facility proportioned to the violence of the vomiting.—

If the emetic does not act upon the bowels, it should be followed by the exhibition of a cathartic. Provided the patient can retain it, there is no objection to the usual purgative, calomel and jalap; but that which I have found equally, and often more effectual and serviceable, and at the same time less nauseating as a cathartic, is calomel and castor oil: the calomel may be mixed and given in a spoon with a little syrup, and the castor oil soon or immediately afterwards. Jalap and cream of tartar are also an excellent purgative, and where there is much fever present, as well, or better calculated to answer the purpose than any other.

We are informed by Sir John Pringle, that Dr. Saunders exhibited rhubarb and senna with success in several cases of obstinate intermittents. And that Mr. Drummond, surgeon, hearing of Dr. Saunders' practice of giving tincture of senna and rhubarb about seven hours before the coming on of the paroxysm, tried it on himself and thirty soldiers with success.*

After the paroxysm has subsided, we should endeavor to prevent its return, by stimulants and tonics. Of the latter, Peruvian bark and the white oxyde of arsenic are the most effectual. The bark should be taken during the intermission in as large quantities as the stomach can bear, mixed either with pure water or a little wine or spirits. From one to two drachms may be taken in this way every two hours. Where the intermissions are long, it will be better to defer the use of the bark till within five or six hours of the expected paroxysm, and then take it freely every hour or two hours, and in such quantity as the stomach can bear. When the stomach is weak, or nauseates the bark by itself, aromatics may be added, as cinnamon, cloves, mace, &c.; should it be rejected even in this way, the bark may be given in the form of watery infusion in combination with the same articles.

When the disease assumes a malignant aspect, and the paroxysms become more frequent and protracted, the bark must be exhibited frequently and in large quantity. On

"And wishing," says he, "to follow this indication of nature, I made a great number of experiments on dogs. I was very often led to believe the emetic a good remedy, as I sometimes met with seven or eight cases which terminated in the same way and were altogether favorable." *Fontana on Poisons, Vol. II. p.* 10.

* Sir John Pringle, Med. Annot. Vol. VII. p. 63. MS. as quoted by Gardiner. Anim. Econ. p. 448.

some occasions it will be desirable and necessary to take two or three ounces between the paroxysms.*

It sometimes, though rarely happens, that the bark fails to effect a cure; sometimes the patient is unable or unwilling to take it; in such cases, I have generally succeeded with the oxyde of arsenic either in solution or substance.—Twelve drops of Darwin's saturated solution may be given three times a day. I generally, however, prefer giving it in the form of pill; combining one third or the fourth of a grain of arsenic with a quarter of a grain of opium, of which the patient is directed to swallow one every four hours, till the quantity of two or three grains of arsenic has been taken. To obviate any unpleasant effects that may arise from the use of this article, a cathartic may be subsequently exhibited. Bark, however, when the patient can be prevailed upon to take it, I have always found much more certain and effectual than arsenic, and is moreover free from the danger that sometimes attends the exhibition of of this mineral poison.

The paroxysms may likewise be prevented from returning, by the use of diffusible stimuli; of these, the most efficacious appears to be opium. This may be given either in the form of pill or tincture. About two grains taken an hour and a half before the time of the expected paroxysm

* The environs of Modena were formerly subject to a class of diseases, which Torti has denominated malignant fevers, inasmuch as they carried off the patient during the third paroxysm, and even when he was considered out of danger. Debility, drowsiness, and excruciating head-ache, were the principal symptoms of these fevers, between which and those of Egypt, says Assalini, there exists a strong resemblance. At this day the malignant fevers of Torti have either disappeared altogether, or are become very rare. This change has been attributed to the filling up of the ditches and marshes which surrounded the city and citadel of Modena; the corrupt waters of which occasioned exhalations which infected the air. "The celebrated Torti," says Assalini, "has taught us the mode of curing this disease as if by enchantment, by means of Peruvian bark, given in large doses frequently repeated. I had an opportunity of seeing and treating this disease near Mantua; its course is so rapid and its symptoms so violent, that in order to stop its progress I was always obliged to give three ounces of bark mixed with wine or water, in the course of twenty-four hours, between one paroxysm and another; and when the patient was weak, I did not omit adding more or less of liquid laudanum, according to the state of the constitution. Those physicians, says he, who from a dread that this practice will overheat, or cause obstruction, prefer the use of refrigerants, or purgatives, in order to evacuate the bile, have constantly the mortification of seeing their patients carried off as if apoplectic, and in a very short time; and if they escape, often suffer from fever for several months, they at length become dropsical, which they never fail to attribute to the bark which they are too late in prescribing." *See the Appendix to Assalini on the Plague, Amer. Edit. p.* 200.

will generally succeed in preventing its return; or fifty or sixty drops of laudanum may be given instead of the opium, with the same effect. The efficacy and certainty of this remedy will be increased, if, after taking it, the patient goes to bed, and drinks freely of some warm mint, sage, or snake root tea. For the same purpose that we employ laudanum, paregoric may be substituted; and as being more disposed to excite perspiration, it has perhaps an advantage over laudanum or opium alone. Two, three or more tea spoonfuls of this may be given to an adult an hour or two before the ague is expected, with the employment of the other means recommended in the use of opium.

A variety of articles are sometimes substituted for the Peruvian bark, such as quassia, gentian, columbo, the cherry, dogwood, black oak bark, &c.; some of these I have sometimes had recourse to for want of the Peruvian bark, but their virtues are trifling and inconsiderable when compared with this valuable medicine.*

SECTION II.

Of the Operation of the Remedies employed in Intermitting Fever.

By observing that the paroxysms of intermitting fever are terminated by sweating, we are led to the conclusion, that the subsidence of the fever is essentially connected with this evacuation. And as the most obvious inference, we

* For the preventing the return of the paroxysm of fever and ague, Celsus recommends the following practice—which, by the by, it may be observed, is much superior to many popular remedies and expedients of the present day. "When the third fit is expected, which may possibly come on, the patient must be brought to the bagnio, and care must be taken that he be in the bath at the time of the shuddering. If he have felt it there also, let him do the same, nevertheless, when the fourth fit is expected; for by this repetition it is often removed. If the bath proves unsuccessful before the fit, let him eat garlic, or drink hot water with pepper: for these two raise a heat, which repels the shuddering. After that, before the shuddering has time to come on, let him cover himself up in the manner above directed under the article of coldness: and it is proper immediately to apply all around his body pretty hot fomentations, and chiefly extinguished tiles and coals wrapped up in cloths." *Grieve's Celsus*, B. III. c. xii. p. 138.—This practice was in part imitated by Sydenham, who to prevent the return of the paroxysms of autumnal tertians directed the patient to be placed in bed and well covered with bed clothes; and for the purpose of exciting perspiration prescribed milk whey, with the addition of sage tea, four hours before the approach of the paroxysm.

are induced to believe that the immediate cause of the fever itself is expelled with the perspirable matter. In further support of this opinion, it may be remarked, that the sweat in fevers has often been observed to possess a strong pungent taste and smell.

The utility of blood-letting in the hot stage of fever, may be ascribed to several circumstances resulting from its employment. In the first place it lessens the strength and activity of the circulation by the abstraction of stimulus from the arterial system. As the blood is the natural stimulus of the heart and arteries, every diminution in the quantity of this fluid must, under ordinary circumstances, diminish the strength of their contractions, and produce a corresponding abatement in the force of the circulation. As it is in a great degree the force and activity of the circulation which occasion the preternatural heat in the paroxysm of fever, so a reduction in the impetus and celerity of the circulating fluids will produce a corresponding diminution of the fever; whether this diminution is occasioned by blood-letting, a cathartic, or the cold bath.

Another effect of the abatement of the circulation is the production of a perspiration. We know from experience, independent of all reasoning or theory upon the subject, that a very hot state of the surface is attended with a constriction of the amaller vessels and a parched and dry skin. Blood-letting, by subduing the force of the circulation, moderates the heat of the surface and relieves this constriction of the extreme vessels, thereby giving exit to the perspirable matter. Sometimes the effects of bleeding are disproportionate to the quantity that has been drawn. Where a large orifice has been made, and the blood has flown freely, the sudden abstraction of twelve or sixteen ounces of blood, or even a less quantity, often brings on a faintness, with a weak and irregular and sometimes an intermitting pulse.—It appears that in such cases the blood vessels have not had sufficient time to adapt their dimensions to the lessened volume of the circulating mass; but retaining for a short time their original capacity, the blood is not firmly embraced by the sides of the arteries, and of course does not feel the full force of their contraction. This effect is apt to take place in persons of full habits and robust constitutions, and might afford matter for alarm to the young and inexperienced; he, however, soon has the satisfaction to find that this weakness and irregularity of the pulse lasts but for a short time, being, in all probability, soon followed by a free and general perspiration and an abatement of all the symptoms;

and even in cases of remittents is succeeded by a complete intermission or apyrexia. It sometimes happens that bleeding, instead of weakening, raises the pulse, increasing the strength and fulness of the circulation: we may here suppose that the heart and arteries were previously oppressed and overloaded, the quantity to be moved being disproportionate to the moving power; by diminishing the load by which they were oppressed, the heart and arteries are enabled to rise and act upon the remainder; insomuch, that a second, third, and a fourth bleeding are sometimes required to bring about an equilibrium between the stimulus of the blood and the irritability of the vessels. In cases of typhus, the action of the arterial system is weak; or if the pulse is full, it is destitute of strength; the fulness appearing to be occasioned more by the relaxation of the artery than by the actual vigor of the circulation. Here there is an actual debilitated condition of the muscular fibre, as the cause of this lessened vigor of the circulation and this torpor of the nervous system. As the debility and want of energy in typhus does not depend upon an overstrained plethora of the vessels, but are occasioned by an absolute diminution of the vital principle, consequently blood-letting under such circumstances can be productive of no benefit, but on the contrary must prove very injurious. I have never, in my own experience, or in my observation of the practice of others, found the least benefit from the employment of blood-letting in the typhus or asthenic stage of fever, however strongly recommended by Dr. Rush, who, in his simplification of diseases, endeavored to introduce a corresponding simplicity of treatment; a treatment as unfounded in theory in relation to typhus, as it is injurious and destructive in practice. Though the system is freed from a portion of morbid matter in the blood that is drawn in venisection, yet the quantity in this way extracted bears so small a proportion to the whole, that but little of the benefit of this operation can be ascribed to this circumstance. The utility of blood-letting appears, principally, to consist in moderating the violence of the excitement, thereby preventing an undue engorgement, and a lesion of the vital organs and other viscera of the body, in bringing about the operation of the different functions, and more especially in restoring the perspiration, and thereby enabling the system to throw off the morbific matter.

The manner in which emetics prove serviceable in intermitting as well as in remitting fever, appears to be the power they possess of evacuating morbid matter from the system.

This is very evident, as it respects the bile and other offensive matters rejected from the stomach; which, as already observed, in all probability contain a great share of the morbid poison, determined from the other parts of the body to the liver, as their proper and natural emunctory. The perspiration, which is often excited by their use, acts upon the same principle in relieving the system from the excessive accumulation of hurtful and excrementitious matters.

As it respects the operation of cathartics, it is merely necessary to remark, that their utility is derived from their power in effecting the expulsion of offending matter. In fevers, the stomach and bowels are the general reservoirs of morbid accumulations; hence the necessity of preventing the formation of such collections, which in bilious cases cannot fail to prove highly detrimental, and to aggravate and prolong the continuance of the fever.

As has already been observed, the paroxysm of intermitting fever is ushered in by an affection of the nervous system; in consequence, it is presumed, of the morbid matter acting upon the brain and nerves through the medium of the circulating fluids. Now, as this affection of the nervous system is owing, in some measure, to an undue degree of irritability, it is obvious that by diminishing this state, the system will be rendered less irritable, or altogether insensible to the morbid stimulus. Accordingly, it has been found by extensive experience that a large dose of opium, exhibited a short time before the expected recurrence of the paroxysm, has in many instances altogether prevented its appearance. The application of tobacco to the pit of the stomach, has also produced the same effect according to Dr. Tissot, who observes, "Dr. Monteith first mentioned to me that he had succeeded in stopping the fit, by putting a quantity of tobacco to the pit of the stomach, so as to occasion nausea and faintness at the moment of the invasion of the cold stage. I made trial of it in several instances, and met with equal success."* It should be remarked, however, that where the cause of fever is strong and virulent, and this disease is disposed to malignancy, the exhibition of opiates, diffusible stimuli, or narcotics in any form, is neither safe nor effectual, except in moderate quantities only; for though they should have the effect in preventing the recurrence of the chill or ague, yet as the offending cause is not removed, it acts with a deadly weight upon the system. This will be

* Tissot on Fever, p. 70.

more especially the case where the stomach and bowels are loaded with offensive colluvies.

We know that debility and irritability are in many instances inseparably connected, and this is particularly observable in invalids subject to intermitting fever. Therefore, by giving a degree of artificial tone and vigor to the system, its irritability will be diminished; and as the excretions are increased and rendered more healthy and perfect by the remedies employed, the morbid matter is eliminated in due time from the mass of circulating fluids. In this way appear to operate the vegetable and mineral tonics, as Peruvian bark, bitters, arsenic, &c. These remedies, also, have a very considerable effect in promoting perspiration and the other natural excretions of the body. In this way I have frequently observed one or two doses of bark abate and carry off the lingering paroxysm of a fever, in which the skin, previous to its exhibition, was dry and crisp. "Some contend," says Alibert, "that the bark produces its most salutary effects without exciting any critical evacuation.—But Albertini is of a different opinion. (*De Bonon. Scient. et art. institut. atque Acad. comment.*) He maintains that he never saw a fever effectually removed by this remedy without being followed by a crisis, similar to that which nature, or if the idea may be more acceptable, which other remedies generally produce. Albertini ascribes to the bark the power of producing not only sweat, stools and urine, but also of increasing the insensible perspiration; and in confirmation of this latter opinion, he adduces a multitude of facts."* Mr. Cleghorn, in his treatise on the diseases of Minorca, observes, that "the great advantage which occurs from the early use of the bark in tertians is, that it invigorates the powers of the body, prevents or removes the dangerous symptoms, and brings on a crisis soon, and with little disturbance. Instead of suppressing any beneficial discharge, as some have asserted, we daily observe a laudable separation in the urine, warm, profuse, universal sweats, plentiful bilious stools, and sometimes the hæmorrhoids and menses come on after it has been used; though it effectually restrains the colliquative night sweats, to which persons weakened by tedious intermittents are incident."†

It may be objected to the doctrine of morbid matter in the fluids as the cause of fever, that the paroxysms of intermittents often continue to recur for several weeks, and even

* Alibert on Malig. Intermit. p. 250.

† Diseases of Minorca, p. 206.

months, after a removal to a healthy situation. Though this may serve to prove that unassisted nature is not always able to effect a speedy cure, it by no means establishes the conclusion, that the paroxysms are not occasioned by the same internal condition of the system which first gave rise to them. It has already been remarked as highly probable that the morbid matter is not entirely eliminated from the body at the end of every paroxysm, but only so much of it as to render the remainder in some degree compatible with the healthy functions of the animal economy. But, as has already been shown, this matter possesses the power of assimilating a portion of the fluids to its own nature, so that when an excess of morbid assimilation again takes place, the paroxysm will in like manner be repeated. It appears that a very small quantity of morbid poison is sufficient to occasion disease by the power of assimilation; and in order to prevent this, it is necessary to give a degree of artificial strength or insensibility to the system, and to enable it to effect the expulsion of the morbific matter.

A certain degree of the assimilation of the materials of disease is necessary to disorder the healthy functions of the animal economy: if this assimilation is inconsiderable, no inconvenience of moment arises; if greater, occasional indispositions are experienced; and if in morbid excess, fever developes itself with all its characteristic features. We know that a certain time, longer or shorter, in different cases, is required after exposure to infection before the person becomes affected with disease; during this time the process of assimilation is going on; but the materials of disease may be prevented from accumulating by the timely use of evacuating remedies; or by such as increase the action and vigor of the excretory organs, and diminish the irritability of the general system.

SECTION III.

Cure of Remitting Fever.

In the bilious remitting fevers of the southern states, there is generally a considerable degree of vascular excitement present at the commencement, and which frequently requires the employment of the lancet for its removal. In the use of this remedy, however, several circumstances are to be taken into consideration; as the degree of vascular

action, and the violence of the fever; the condition of the patient, as influenced by age, previous health or indisposition, habit of body, &c.; the nature of the epidemic, as being more or less disposed to typhus or collapse, or to assume the inflammatory character; the season of the year, &c.

I would just premise, before going into the detail, that there are probably but few places or seasons in the southern states, where the prudent employment of blood-letting would not be found serviceable in the commencement or progress of summer or autumnal fevers. Upon the use of blood-letting in the fevers of hot and tropical climates, much diversity of opinion exists among physicians.

Dr. Clark* disapproves of bleeding in hot climates, except in strangers, where he considers that a moderate bleeding is admissible.

Pringle observes that bleeding is dangerous, except in recent cases, and in strong full habits.†

Hunter disapproves of blood-letting in the fevers of Jamaica, even when the symptoms are high; "but if it was copious," he observes, "or repeated a second time, it was hurtful."‡

Upon this subject, Burserius makes the following observations. "But in the summer season, when the quantity of blood is less, on account of its most subtile parts having been converted into vapor; when all the fluids incline to become thinner; when they manifest the greatest propensity to alkalescence and corruption; and when the bile is more copious and warm than usual; we must not have recourse to bleeding rashly."§

We are informed by Dr. Chisholm, in his account of what he calls *the malignant pestilential fever* of Granada, that blood-letting was employed with fatal consequences. "In the present instance," says he, "the ardent heat of the surface, the oppressed hard pulse, the pain of the side, the oppression at the precordia, the head-ache, and the throbbing of the temples, seemed strongly to indicate the use of bleeding. Although the blood drawn was remarkably florid, and always threw up an inflammatory crust of greater or less thickness; and although the pains seemed to undergo a temporary mitigation, yet the consequence, at the expiration of a few hours, was always fatal. I was the more surprised at

* On the Diseases which prevail in Long Voyages, p. 121.
† Diseases of the Army.
‡ Diseases of Jamaica, p. 148.
§ Institutes of the Practice of Medicine, Vol. I. p. 256.

this, (he continues,) as the patients were remarkably robust, florid, and generally in the vigor of life."

So much against bleeding in the fevers of hot climates: but on the other hand, there are a number of the most respectable physicians who speak of blood-letting in the warmest terms of approbation.

Hippocrates recommends bleeding in acute diseases, if the complaint is of an aggravated character, the patient young and of a robust constitution.*

The principal dependance of Dr. Rush in the cure of the bilious remittent fever of Philadelphia in 1793, was upon the lancet.

Dr. Jackson,† who had extensive opportunity for observation on the nature and treatment of bilious diseases in the West Indies, says it is no unusual thing to observe that persons debilitated to the last extreme, that is, persons in fever, who were as it were paralyzed, and incapable of producing a single action of effect, rise instantaneously into full force and vigor, in consequence of a copious bleeding. The mode and measure of his practice are similar to those of Dr. Rush. The blood, he informs us, should be drawn from a large orifice, not measured by ounces, but allowed to flow till the end is obtained, the symptoms relieved, perspiration, sickness, vomiting, evacuations by stool, or faintness ensue.—Dr. Jackson, however, had recourse to the lancet with some discrimination. "In the commencement of fever," says he, "when the disease declares itself by the symptoms of a paroxysm violent and in form, or only by headach and general uneasiness, the author has been in the habit, particularly in times of sickness, and in subjects lately arrived from Europe, to order blood to be drawn from the arm to the amount of twenty ounces or upwards. This, followed by a dose of physic, salts, and emetic tartar, or calomel and James' powder, is frequently sufficient to remove the complaint." In many cases, he tells us, the loss of less than thirty ounces will not answer. He even recommends bleeding where the symptoms are such as to deter entirely an ordinary practitioner from it, and where, could we judge from the symptoms, its employment, if not decidedly hurtful, would at least be of equivocal utility. "If the pulse be small," says he, "contracted, confined, obstructed, even imperceptible, with a dry, withered and impervious skin, or a skin greasy, damp, and clammy, a countenance livid, respiration hurried and

* De Rat. Vict. In Morb. Acut. Opr. Om. p. 395.
† Outline of the History and Cure of Fever, p. 264.

oppressed, without local pain, a condition supervening suddenly, or arising under the use of stimulating powers, the loss of thirty ounces of blood or more, has often been unexpectedly followed by a developement of the action of the vascular system: even petechiæ, vibices, and lividnesses have disappeared in consequence of it, the pulse emerging, and a copious fluid perspiration ensuing. It must, however, be remarked, that where these fortunate events took place from bleeding, stimulating means of great power always made a part of the process."

Most practitioners have probably observed, in some part of their practice, the sudden sinking of the pulse from bleeding, and the coldness and faintness which speedily supervened. Such symptoms call for the use of stimulants, and wine should be given in moderation till they are removed. It is remarked by Dr. Jackson, by way of caution, that though bleeding is a remedy of great value in certain conditions of the fevers of tropical countries; yet, that it is also in many cases a remedy, not only unnecessary, but improper, and even dangerous. It is unnecessary, he informs us, when the disease is of a distinct intermitting or remitting form, when the paroxysms are regular in all their parts, and terminate by copious perspiration, with softness, warmth, and sensibility of skin; it is improper, where the skin, bathed in fluid perspiration, seems to be of an increased sensibility; when the pulse is lax and weak, is easily disturbed by changes of posture; and where fainting occurs from an increase of mobility, rather than from torpor.

Upon the subject of blood-letting in yellow fever, Dr. Moseley observes,* that "it is not a few ounces of blood, however well timed, and if not well timed bleeding should not be performed at all, that will answer the end in the yellow fever or in plague. * * "Such people only reprobate bleeding in pestilential fevers who never saw it used in a proper manner. It has either been performed on improper subjects, or too late, or in too small quantity, and when the practitioner has stopped at one, or two bleedings, where five or six, or what I have often known ten or twelve, ought to have taken place."

Dr. M'Lean, in his inquiry into the nature and causes of the great mortality among the troops in St. Domingo, remarks, that even feeble persons who may have resided for some time in a hot climate, if they are seized with acute diseases he can see no impropriety in blood-letting. "If

* Medical Tracts, p. 225.

blood-letting," he continues, "produces good effects, which I believe it does in most instances, it must be performed very early in the disease, and be performed with boldness."*

In the fevers of Jamaica, Lempriere recommends blood-letting before the disease is completely formed, and is of opinion that if it were adopted the first moment the patient begins to complain, in many instances a total stop would be put to the progress of the fever. "As to blood-letting, however, after the disease is formed, (he observes,) I have given the practice such repeated trials, and there are practitioners in Jamaica as well as myself, who can vouch for the fatality of its consequences.†

In the yellow fever, Hillary recommends bleeding in the first three days, to moderate the violence of the circulation.

Clark says bleeding was dangerous or fatal if employed after the first thirty-six hours, though in young people it might be admissible to a certain extent at the commencement.‡

It is observed by Baron Larrey, that in the yellow fever of Egypt, a small quantity of blood taken from the arm was serviceable; but that copious blood-letting was fatal.§

Leaving these various opinions to their own counterpoise and balance, it may be observed that in the use of the lancet there are some sure and certain indications which can never be mistaken. If the physician, called at an early stage of the disease, finds the patient young, florid and plethoric, with flushing of the face, redness of the eyes, pain in the head and back, hot, dry and caustic skin, much thirst, white furred tongue, and a pulse frequent, full and strong, or small and wiery, he will not prudently hesitate to have immediate recourse to blood letting; which, although I have seldom thought proper to carry to the extent recommended by Dr. Rush and Dr. Jackson, should still be sufficient to moderate the symptoms and produce a change in the action of the vascular system; when these changes are observed to take place, our object in the employment of the lancet is accomplished. During the flow of blood the finger should be occasionally applied to the artery of the disengaged arm, to observe the changes which take place from the loss of blood. The pulse becoming softer and slower, or even more frequent but free from tension, the pains abating, or the skin

* M'Lean's Inquiry, p. 131.
† Diseases of the Army in Jamaica, p. 118.
‡ On the Yel. Fev. of St. Domin. Dunc. An. Med. Vol. Vol. II. p. 165.
§ Larrey's Memoirs, Amer. Edit. Vol. I.

appearing moist and perspirable, are the symptoms which govern, in a considerable degree, the quantity to be taken. It is evident, however, that much will depend upon the stage of the disease and the circumstances of the patient. I have sometimes found it necessary in persons of strong and robust constitutions, or of plethoric habits, to draw blood to the extent of twenty or thirty ounces before a favorable change could be obtained. On other occasions I have found ten, eight, or even four or five ounces sufficient. When the bleeding is pushed beyond the extent which the symptoms require, an unnecessary and hurtful degree of debility is produced. It is better to have recourse to this remedy at several times successively, should the disease require it, than to extract more blood than is necessary at a single operation.

The more inflammatory the symptoms, the greater will be the necessity and benefit of bleeding. In endemic fever there is often a congestion of blood, or a degree of inflammation in some of the internal viscera, as the brain, lungs, liver, spleen, stomach, &c. This is frequently the case even when no considerable degree of pain or uneasiness of the affected part is complained of. In such cases, the blood, when it has flowed freely from a large orifice, is found to exhibit the buffy or inflammatory crust upon its surface. In instances of this nature it is frequently necessary to repeat the bleeding several times, and in proportion to the demand and urgency of the symptoms: when these are such as first authorized and required the use of the lancet, the remedy should still be repeated, even to the seventh or eighth time: or if blood-letting has been neglected at the commencement, and the state of the patient should be such as to require it at a subsequent period, we may safely have recourse to it at any stage of the disease. If asthenic symptoms, however, have made their appearance; if the strength be prostrated; if faintness and disposition to syncope come on from the patient's being raised to an erect position, though the pulse upon slight pressure of the finger be full and regular, yet easily disturbed, becoming irregular, weak and faltering, upon a change of position or from an erect posture; if the heat of the surface and extremities be moderate, or below the healthy temperature, though intense and burning at the pit of the stomach, either to the sensation of the patient or to the feeling of the physician; should the head even be considerably affected, with derangement and alienation of mind, or should there be considerable palpitation of the heart at the same time, under such a combination of all or many of these symptoms, we must refrain from the use of the lan-

cet. Though from such a state the patient sometimes recovers, yet the employment of blood-letting would be sure to hasten the fatal termination: the sensibility and power of the arterial system being already too much exhausted, and by the abstraction even of a moderate quantity of its natural stimulus the patient would be prostrated below the reclaiming powers of medicine. Dr. Lind observes that bleeding is always dangerous in proportion to the violence of the taint, and that fevers highly malignant will not bear bleeding.—Many practitioners, from an undue prejudice in favor of this remedy, have recourse to it with indiscriminate hardiness in every variety of type and stage of fever. Such, in a great measure, was the practice of Dr. Rush, who could find argument and reason for every error of opinion. "I have seen," says Dr. Fordyce,* "in the hospitals of France, a fourth or fifth bleeding ordered in the last stage of fever with delirium, and black tongue, and teeth covered with a black tenacious slough, in a word, with the pathognomonic signs of putrefaction and malignity. A speedy dissolution was the consequence, as might naturally be expected." In page 71 he adds, "Though I believe it will hold pretty universally, that fevers truly putrid may bear one bleeding in habits very plethoric, yet a second or third generally proves deadly.

In the use of the lancet, the good sense and discrimination of the judicious practitioner can alone decide as to its propriety and application. The epidemic of one season may prove more inflammatory than that of another, and require the more liberal and repeated use of the lancet. The fever of the succeeding season may be more malignant and disposed to run more speedily into the asthenic stage. In the latter instance, blood-letting must be employed at an early period, or else entirely omitted. The practitioner will soon be enabled to judge of the propriety and importance of this remedy, by observing the effects produced upon the patient.

It will readily occur to every person of reflection, that the violence of the fever and the strength of the circulation will, *ceteris paribus*, be in proportion to the vigor and activity of the moving powers, as influenced by age and the soundness of the constitution; the tension, strength and elasticity of the muscular fibre; and the denseness and richness of the blood, as occasioned by a large proportion of gluten and red globules; under these circumstances the more liberal use of the lancet will be required.

* Inquiry into the Causes, Symptoms and Cure of Put. Fever, &c p. 170

Before concluding my observations upon blood-letting, I will subjoin a comprehensive view of the principal circumstances which demand attention in the employment of this remedy, and which appear to be the following. The degree of excitement present. The malignity, mildness or inflammatory character of the epidemic. The situation, whether town or country, low and marshy, or elevated and dry. The period of the disease. The age and constitution of the patient; his former habits and modes of life, as connected with occupation, temperance, &c. The effects of blood-letting. The appearance of the blood drawn.

Upon each of these subjects it will be proper to make a few remarks.

The higher the excitement the greater will be the necessity for bleeding, and the more copious should be the evacuation.

The more malignant the epidemic, the more and sooner is it disposed to assume the asthenic character, and the more early and cautious should be the use of the lancet.

In large towns, the disease is apt to be more malignant than in the country, as also in low and marshy places rather than in those that are dry and elevated.

Young, robust and plethoric persons, require larger bleedings than the old, intemperate and infirm. Persons of sedentary employments require the more sparing use of the lancet than those whose exercise is more laborious and in the open air. If the patient has been in the habit of being often bled, there will also be a greater necessity for its repetition.

In general, the earlier in the disease the more requisite the use of the lancet.

The effects of the bleeding should regulate the quantity to be drawn, and determine the propriety of its repetition. If the symptoms continue unabated, it should be repeated. If the disease is moderated and the patient continues to improve, or symptoms of asthenia have come on, bleeding again is unnecessary, and would, in all probability, prove injurious.

The appearance of the blood drawn should also regulate, in some degree, the extent of the evacuation.

The appearances of the blood in fevers may be divided into three kinds. 1st. In those cases where there is much excitement, or what is called the inflammatory diathesis, the blood upon standing becomes covered with what is termed the *buffy coat*, consisting of the coagulum or crassamentum, from which the red globules have separated and fallen to the bottom of the vessel, in consequence, it would seem, of the greater fluidity of the blood, occasioned by the in-

creased temperature of the body* and the accelerated action of the blood vessels. In general, the thicker is this buffy coat, and the greater its contraction, rendering its upper surface concave or cup-like, the greater is the indication for the necessity and repetition of the operation. The inflammatory diathesis, however, is on some occasions present without being indicated by the appearance of the buffy coat, and the latter sometimes appears in cases where the use of the lancet is found prejudicial. The circumstances favorable to the appearance of the buffy coat are, the blood freely flowing from a large orifice into a deep vessel, so as not to cool and coagulate before the red globules have time to subside. If, on the contrary, the blood flows slowly, and is received into a broad and shallow vessel, the separation will not take place, though the inflammatory diathesis be present.† 2. When the disease has been of long continuance, the blood becomes thin and watery, containing but few red globules. I have sometimes seen the blood so thin and watery in invalids who had been a long time subject to fever, that it would scarcely stain the patients linen. I once attempted to bleed a person of this description, who had experienced a return of his fever, and whose pulse, from its fulness and strength, indicated the use of the lancet. His blood was scarcely colored, and, before half a gill had been taken, the sudden sinking of the pulse obliged me to stop the orifice. Such, also, is the appearance and condition of the blood in diseases of debility and in dropsy; in all of which blood-letting is generally improper. 3. Blood-letting is still more dangerous when the blood is dark colored and dissolved in its texture, and does not readily coagulate, as in scurvy and the advanced stages of the more malignant forms of fever.

When the epidemic is of such a violent and malignant character as to destroy life in a few hours, copious bleeding at the commencement promises to be the only valuable and efficient remedy that can be resorted to. Mercury, emetics, cathartics and the inferior order of remedies are here inadequate to cope with the gigantic strides and rapid progress of this formidable disorder. The enemy must be immediately

* It is remarked by Dr. Fordyce, that the greatest degree of heat he ever observed in fever was 105°. Fordyce on Fever, Dissert. 1st.

† The blood when at rest in the body begins to coagulate in fifteen minutes. *Hewson's Experimental Inquiry, Vol. I.*

Blood with the inflammatory crust does not coagulate in less than an hour and a half. *Ibid.*

The blood is really attenuated in inflammatory disorders. The coagulable lymph is thin, and its disposition to coagulate is lessened. *Ibid.*

attacked in his strong hold and fortress, the vascular system; and this not with the cautious timidity and ill judged prudence of apprehension and distrust, but with the bold and vigorous hand of confidence and resolution. The following fact is mentioned by Dr. Sydenham in relation to the plague which prevailed in his time at Dunstar Castle, in Somersetshire. "It happened at that time," says Dr. Sydenham, "that a surgeon, who had travelled much in foreign parts, was in the service there, and applied to the governor for leave to assist his fellow soldiers, who were afflicted with this dreadful disease, in the best manner he was able; which being granted, he took so large a quantity of blood from every one at the beginning of the disease, and before any swelling was perceived, that they were ready to faint, and drop down; for he bled them all standing and in the open air, and had no vessel to measure the blood, which falling upon the ground, the quantity each person lost could not of course be known. The operation being over, he ordered them to lie in their tents; and though he gave no kind of remedy after bleeding, yet of the numbers that were thus treated, not a single person died." In relation to this subject the following observations are made by Dr. Rush. "In fevers and other diseases which run their course in a few days or hours, and which threaten immediate dissolution, there can be no limits fixed to the quantity of blood which may be drawn at once, or in a short time. Botallus drew three, four and five pints in a day, in such cases. Dr. Jackson drew fifty-six ounces of blood at one time, in a fever of great violence and danger. This patient was instantly relieved from what he styled "chains and horrors." In three or four hours he was out of danger, and in four days, returned to his duty. Dr. Physic drew ninety ounces, by weight, from Dr. Dewes, in a sudden attack of the apoplectic state of fever, at one bleeding, and thereby restored him so speedily to health, that he was able to attend to his business in three days afterwards."* It is obvious that such copious bleedings are only admissible in the first stage of the disease. And as it is the nature of highly malignant fevers, when they are not suddenly fatal, to run speedily into the low, chronic, typhus or asthenic state, blood-letting cannot be resorted to in such cases with safety, except at an early period of the complaint. There are doubtless some epidemics in which bleeding would be inadmissable after the first or second day, and this

* Rus. Inq. & Obs. vol. 4, p 350 & seq.

more especially when the fever is of a highly malignant character. This was the case, we are informed by Dr. Rush, in the yellow or bilious fever of Philadelphia in 1797. It is also stated by Dr. Jackson, that nineteen out of twenty of the soldiers whom he attended in the West Indies were cured by copious blood-letting, provided it was performed within six hours after the attack of the fever. Beyond that period it mitigated its force, but seldom cured. The quantity of blood drawn by Dr. Jackson, in the early stage of the disease was always from twenty to thirty ounces.*

Though considerable discrimination and judgment are required in the use of the lancet, there can be no doubt that when judiciously employed it is one of the most valuable remedies that can be had recourse to in the treatment of the endemic fevers of the southern states. And though there be cases of excitement so strongly marked as not to leave a shadow of doubt as to the propriety of blood-letting, yet there are others of langour and depression, from, plethora and an overcharged state of the blood vessels, which at first view would seem to forbid its use, but wherein the employment of this remedy would prove highly advantageous. Cases of the latter description are not easily distinguished, and as it is very easy for the young and inexperienced to be deceived, they will generally find it safer in all doubtful cases of this nature to avoid the use of the lancet altogether, and to employ it in unequivocal instances of preternatural or inflammatory excitement only; and this more especially where the epidemic is of a highly malignant character.

It was observed by Dr. Rush, in the bilious yellow fever of Philadelphia in 1798, which was more fatal and malignant than the epidemic of 1793, that in several cases the lancet was forbidden at the commencement altogether, from the weakness and frequency of the pulse, languid eye and other symptoms of prostration; but that nature performed the operation of bleeding on herself from the gums, on the fourth or fifth day. "I saw," says the Doctor, "several pounds of blood discharged on those days, and in that way with the happiest effects. It appeared to take place after the revival of the blood vessels from their prostrated state."†

When bleeding is not indicated, or after its employment when it is, an emetic should generally be exhibited. For this purpose six grains of tartarized antimony may be dissolved in half a pint of warm water, and taken in divided

* Rush Inq. & Obs. Phil. Ed. 1809, vol. 4, p. 35.
† Rush Inq. & Obs. vol. 4, p. 78.

doses at intervals of ten or fifteen minutes till it has operated sufficiently.

The use of emetics in the beginning of fever dates its commencement with the infancy of the healing art. Hippocrates speaks of their utility when employed at an early period. Sir John Pringle disapproves of them in the progress of the disease, though, in his account of the bilious remittant fever of the Netherlands, he highly extols their efficacy when exhibited in the forming stage of the disorder; and says that when a large quantity of bile was evacuated by an emetic, the fever was removed at once. Huxham placed great reliance on emetics and purgatives in the cure of epidemic diseases.* We are told by Dr. Rush that during the American war an emetic seldom failed of preventing an attack of the hospital fever when given in its forming state.† Independant, however, of any testimony in favor of this remedy by the physicians of other times and countries, the general experience of the utility of emetics in the fevers of the southern states establishes their importance beyond the power of contradiction. Some West-India writers are opposed to the employment of emetics altogether in the fevers of the tropical climates, from the danger, as they tell us, of exciting an irrepressible vomiting, and increasing the irritability of the stomach: as it respects the fevers of the West Indies I am not authorized to give an opinion, but in relation to the fevers of the southern states generally, emetics are universally admitted to be of the first importance and utility. It is true that emetics sometimes fail. The physician has often the pain of finding all his efforts unavailing; the fatal symptoms, like the shades of the evening, grow thicker and more alarming. But, under every mode of treatment, patients will sometimes die, and that which is most successful alone deserves the preference. I have known emetics themselves injurious, and sometimes fatal. They are injurious when the patient is much debilitated, or when the disease shows an early tendency to prostration. They are prejudicial when the patient is in a fluid perspiration or in the decline of the paroxysm. When the pulse is frequent, small and weak, the countenance livid, wan and dejected; the stomach weak, sick, oppressed, with frequent retching and inclination to vomit, but discharging nothing; emetics under these circumstances should be avoided as we regard the life and safety of the patient.

* Huxham on Epidemics, vol. 1.
† Rush Inq. & Obs. vol. 3, p. 8.

There are probably but very few cases in which an emetic will not be found necessary and useful at the commencement of the disease. When bleeding, however, has been premised, and employed at the height of the paroxysm, and especially if the patient seems thereby to experience a degree of debility from the loss of blood, it will sometimes be proper to delay the exhibition of the emetic for a few hours, till the remission of the fever. But when the loss of blood has produced but little mitigation of the symptoms, the pulse still rising and continuing strong and tense, the skin hot and dry, the emetic may be exhibited without delay. The earlier in the disease emetics are employed the more effectual and beneficial will be their operation, and much of that irritability of the stomach which often accompanies bilious remittents, may be attributed to the neglect of employing emetics at the commencement of the disease: for whoever has witnessed the vast quantities of vitiated bile discharged from the stomach by the operation of an emetic, will easily conceive the injurious consequences that must arise from its being permitted to accumulate in the primæ viæ.

When the fever assumes a malignant aspect, considerable caution is required in the use of evacuants of all kinds, and in none more than that of emetics, particularly the tartarized antimony, which is also apt to act as a cathartic; and when the purgative operation is considerable, we should dread and guard against the prostration which we have reason to apprehend.

In all seasons when the epidemic is of a severe and malignant nature, it will be safer to postpone the exhibition of the emetic till the time of the remission, should this be calculated upon with any certainty, than to employ it in the height of the paroxysm, and run the danger of prostration. If, however, from the state of the patient we have any reason to apprehend that the emetic may operate too severely, or produce a coldness and torpidity of the system, and should still determine upon its employment, as we value the life of the patient, we should watch its operation, and check the first symptoms of collapse by the exhibition of an anodyne, composed of thirty drops of laudanum, or when this cannot be retained, a grain or two of opium in a solid form. Had I not myself been upon the point of loosing some patients in the early period of my practice, from want of attention to the above cautions, I should not feel myself obliged to be so particular; but experience compels me to enjoin this caution upon others. The *nimia diligentia Midici*, of stuffing and oppressing the patient with medicine should be

avoided. Give one remedy time to operate before another is employed; if the fever has been high, and the bleeding, aided by the cold bath, and other febrifuges to be mentioned hereafter, has succeeded in bringing about a perspiration, omit the emetic, even should it be indicated, till the remission takes place; the system will then have recovered sufficient strength to endure its operation: but if given in the height of the paroxysm, there is reason to apprehend that the exhausting and debilitating influence of the febrile excitement and the operation of the emetic will produce a sudden sinking of the vital powers, which will require all our care and attention to overcome, and may very possibly cause the death of the patient.

In epidemic bilious fever attended with great malignancy, emetics should be given with caution or avoided altogether, on account of the sudden prostration and collapse, which in such instances succeed their operation. Thus we are informed by Dr. Rush that emetics were hurtful in the highly malignant bilious fever of Philadelphia in 1797. It is also stated by Dr. Pinkard that they were hurtful in the violent grades of the yellow fever in the West Indies. The same thing was observed by Dr. Jackson. It is admitted by Dr. Rush, however that in the second and third grades of bilous fever they appear not only to be safe but useful.* And the same author in the bilious yellow fever of 1798 and 1799, found the tartar emetic a most valuable remedy in cleansing the stomach and bowels of vitiated bile. And it was observed by him that an emetic given in the forming stage of the disease, seemed to effect an immediate cure.†

When there is much irritability of the stomach with frequent vomiting, emetics are not only unnecessary, but might prove highly detrimental, inasmuch as they would in such instances still further increase this irritation, and render the stomach unable to retain either fluids or solids of any discription. It not unfrequently happens, however, that considerable sickness and irritation of the stomach exist, with frequent and ineffectual efforts to vomit, merely from the foulness and bilous accumulations in the first passages. In such cases the free and plentiful operation of an emetic, assisted by the copious use of warm water or chamomile tea, afford the most decided and effectual relief.

Where we are apprehensive that the tartarized antimony may prove too severe in its operation, either alone or in combination with white vitriol, ipecacuanha may be exhibit-

* Rush Inq. & Obs. Vol. 4.
† Rush Inq. & Obs. Vol. 4 p. 80.

ed; and in delicate and irritable habits this will often be more safe and proper than the emetic tartar.

Less debilitating, though at the same time less effectual than either the tartarized antimony or ipecac. is white vitriol alone. When the object is merely to dislodge the contents of the stomach and procure a temporary relief, the latter may be advantageously employed.

If the patient is of a weekly and delicate habit, if the disease is advanced in its progress, if purgative medicines have been previously given, if the pulse is very frequent, with little strength and fulness, if there is much sickness and irritability of stomach with frequent disposition to vomit and reject whatever is swallowed, it will be safer to avoid the use of the tartar emetic, and should we deem an emetic necessary and safe, from twenty to twenty-five grains of ipecac. with or without a few grains of white vitriol may be exhibited. This, assisted in its operation by the free use of warm water, will cleanse the stomach sufficiently without producing that deadly sickness occasioned by the tartar emetic, or hazarding the event of prostration. In such cases however, it will be generally safer to avoid the use of emetics altogether, and to trust to mild aperients, as cream of tartar, small doses of Epsom salts and injections, to cleanse the bowels and carry off the redundancy of vitiated humours. Frequently the disposition to vomit and reject every thing taken in, proceeds from a degree of inflamation and consequent excessive irritability of the stomach; I have known a patient for days, to reject the greatest part of all fluids taken into the stomach, which were in a short time changed to a grass green colour, occasioned by the operation of the acid taken upon the bilious matters in the stomach; the case was treated with mild aperients and injections, and the excessive irritability and vomiting allayed by giving, from time to time, a table spoonful of lime water and sweet milk mixed together.*

Should not the tartarized antimony operate upon the bowels after having acted as an emetic, it will be necessary to exhibet a cathartic. As the operation of the emetic, however, is debilitating, and is apt to leave the patient weak and languid, it will often be advisable and necessary to delay the

* Lime water is prepared by taking fresh burnt unslacked lime or oyster shells, pouring on hot water so as to slack and disolve a portion of the lime, and after standing about half an hour, the water should be poured off and corked up tightly in bottles, or in decanters with ground stoppers The proportions may be two or three ounces of quick lime to a quart of water; though as the water can only take up a certain quantity it is better to have an excess of lime than too little.

exhibition of the cathartic for a few hours, in order to avoid the danger of prostration. If the emetic, for instance, has been given during the paroxysm, or height of the fever, the purgative may be postponed until the remission, or for the space of five or six hours after the emetic has ceased to operate. In this, however, much will depend upon the habit and constitution of the patient, the height and severity of the fever, and the malignancy or mildness of the reigning epidemic; bearing this in mind, that the sooner the bowels can be evacuated with safety, the more successful and effectual will be the practice.

When we consider the relation and sympathy which subsist between the external and the internal surfaces of the body, particularly between the skin and alimentary canal, we must be convinced of the propriety of keeping up the due action of the latter in order to preserve the former in a perspirable condition. We observe when the skin is dry and constricted, that the bowels are constipated, and that when the latter are free and soluble, the former is moist and permeable to the perspirable matter. When the skin, however, becomes in a measure, permanently constricted, the excrementitious fluids which should be thrown off by this emunctory are determined to the intestines and excite them into preturnatural action; for the purpose, it would seem, of eliminating the offending matter. As serving, therefore, to assist and anticipate the operations and efforts of nature, and to affect the curative indications, cathartics have always formed a leading and important article in the treatment of fever.

It is highly important in this disease, that the bowels be kept carefully free from all bilious and excrementitious accumulations; and this, in many instances, particularly when the disease assumes a malignant aspect, is not easily accomplished. Such is the constriction and torpidity of the bowels that often take place, that it is with great difficulty medicines can be brought to act upon them; and in these cases, we must have recourse to the repeated use of injections, composed of salts, molasses and water, with the addition of a little castor-oil. Should the first and second cathartic not operate after a reasonable time, it will be safer to promote its action by the use of injections than to repeat the purgative by the mouth; for when several doses are confined in the bowels at the same time, should they finally be brought to operate, a hypercatharsis or over purgation might take place, and prostrate the patient beyond the possibility of recovery. Such accidents I have

known to happen from the imprudent repitition of cathartics. In severe and malignant cases, the torpor appears to be attended with considerable constriction of the stomach and bowels; the patient complaining that the substances taken, proceed no further than the entrance of the stomach, and after remaining there a short time are unavoidably rejected.

I have seen so many instances of this kind, that I am inclined to think such a constriction actually takes place. In these cases, neither the cathartics nor injections operate freely; the stools are small in quantity, consisting principally of the injections, mixed with a light clay coloured, membranous or flakey looking substance, appearing more like the inner coat of the intestines than any excrementitious matter of their contents.

There is reason to believe that on some occasions of obstinate constipation, there exists an *intro susceptionn* of some part of the intestinal canal. This circumstance took place in the yellow fever of Philadelphia, in 1805, and was ascertained by the dissections performed by Dr. Stuart and Dr. Parish. This affection was confined to the small intestines, and was found to exist in several fatal cases of the disease. The cause of the intro susception was always from above downwards, the upper portion of the intestine being the *receiver*, and the lower portion the *received*.* "Although the discovery of the existence of the *intro susceptio intestinalis*," says Dr. Caldwell, "is interesting in itself, yet I am sorry to add, that it has shed no new light on the treatment of the disease. We are even unable to enumerate any particular set of symptoms, which during the life of the patient, give satisfactory evidence of the presence of this affection. It

* Caldwell's Essay on the Yellow Fever. The following remarks are offered by Dr. Caldwell in explanation of the manner in which this affection appears to take place: "A tonic spasm or permanent contraction occurs in some portion of the intestine, greatly diminishing its cavity and circumference, and suspending entirely its perestaltic motion. The portion of intestine immediately above this is free from spasm, and retains its perestaltic motion. Perhaps this motion is even increased by the action of some purgative medicine. When such a state of things continues for any length of time, the event likely to result from it, is sufficiently obvious. The upper portion of intestine, forming, by its natural action a fold at the place where the permanent contraction commences, passes down over the lower portion, and receives it completely into its embrace. But as the natural direction of the perestaltic motion is from above downwards, so long as the contraction remains permanent, its lower portion will necessarily continue to be invested by its upper one."

belongs yet to the knife of the anatomist, and to that alone, to discover its existence after death. Could the existence of the *intro susceptio* be clearly ascertained during life, perhaps bleeding the patient ad deliquium animi, would be the most likely way to remove the inflammation and spasm which constitute it."

To this I would observe, that there is probably less difficulty attending both the discovery and treatment of this affection than Dr. Caldwell seems to apprehend: and I think that on several occasions I have discovered its existence by the following symptoms: more or less heat and pain in the bowels, obstinate constipation, which can scarcely be removed by the most active cathartics; a sense of constriction about the stomach, as if substances swallowed were unable to proceed; uneasiness, distention and oppression about the epigastrium, especially upon swallowing any thing bulky, which is apt to bring on vomiting; stools very small in quantity, ash coloured, and of a fibrous or membraneous appearance. For the removal of these symptoms, I have found nothing so effectual as blistering the epigastrium; warm fomentations; when the pain is considerable anodyne enemata of laudanum and warm water; the frequent use of injections composed of warm water, molasses, and a little salt or castor-oil: these, as they excite the perestaltic motion of the large intestines from below upwards, produce that kind of action which is best calculated to remove the *intro susceptio.*

The importance of evacuations by the bowels, will be the more obvious when it is considered what offensive and noxious accumulations are disposed to take place in them, which, by being in part absorbed from the intestines and re-conveyed into the mass of circulating fluids must, unavoidably, aggravate the prevailing symptoms. As the matter contained in the bowels in bilous fever is of the most noxious and excrementitious quality, drained off and secerned from the general circulation, so, where this is suffered to accumulate in any considerable quantity, it is in part taken up by the lymphatics, and by being generally diffused, adds to the contamination of the system; bringing on the typhoid symptoms at an early period, and causing a yellow suffusion on the surface of the body. But if the bowels are kept free from such bilious accumulations, the yellowness of the body is, in a considerable degree, prevented; otherwise tremors, jerkings, and subsultus tendiuum are apt to come on early, and the patient is either carried off by violent convulsions, or by the more conceal-

ed malignancy of the disorder. Though a yellowness of the body is not common in this disease, and although it sometimes appears in cases that are not remarkably malignant, yet, generally speaking, it marks a disease of considerable severity; and where this yellowness is interspersed with livid or purple spots, or with streaks and blotches, we may with considerable certainty, calculate upon a fatal termination. Against this, therefore, we should be particularly careful to guard by the early use of cathartics and injections. Nor should we, on all occasions, be deterred from their employment on account of the frequency, or the weakness and smallness of the pulse, for these symptoms of oppression often disappear upon the operation of laxatives or injections. Besides, this weakness, smallness and thread-like feeling of the pulse often come on at an early stage of the disease, and evidently arise from an oppressive accumulation of bilious and excrementitions matters in the bowels, for upon procuring a free evacuation, the pulse becomes less frequent and more full. Many practitioners, by attending chiefly to the state of the pulse, are apt to overlook the principal circumstance; and when the circulation begins to flag, they fly to cordial and tonic remedies, without reflecting upon the necessity of correcting that condition of the body by which this languor of the heart and arteries is produced; supposing the human machine to be acted upon like a weather-gage, or by the simple addition and subtraction of stimulus: whereas, in fever, mere debility forms but a small part of the disease: it is here the vitiated condition of the fluids and of the body generally, that we have to do with, and the supporting the strength of the system is only a secondary consideration, as enabling us to combat more effectually with the lurking mischief. Stimulents are here of little service, until the matter by which the vital functions are oppressed and paralized, is removed. Bark, wine and cordials, if required, may then be employed with advantage.

It would appear that the beneficial and cooling effects of perspiration do not consist merely in the evaporation from the surface thereby occasioned, but in the excretion of irritating and offending matters from the circulating fluids. We often observe the same effect from the operation of a brisk cathartic in the paroxysm of fever, as takes place from the flow of perspiration; and we hence conclude that independent of the mere removal of fecal matter from the bowels, cathartics possess a more extensive efficacy in drawing off the morbid and excrementitious

fluids of the body, and of preventing the absorption of vitiated secretions from the cavity of the intestines.

Though it is essential to preserve the bowels free from offensive accumulations, yet in the advanced stage of the disease, caution must be exercised in the exhibition of active cathartics. If there is any considerable degree of debility present, or if from the previous intemperate habits of the patient, we have reason to apprehend the early appearance of debility and prostration, we should be economical of the strength of the diseased, and should use the mildest laxatives, as senna and manna, or very small doses of castor-oil, and trust more to the use of injections in cleansing the bowels than to the employment of purgatives given by the mouth. I have known a moderate cathartic given in the advanced stage of fever to sink the patient beyond the power of recovery.

In deciding in doubtful cases upon the propriety or impropriety of exhibiting a cathartic, it is not sufficient that we take into consideration the strength or weakness of the pulse, but we should regard, more especially, the general habit, and the vigor or debility of the animal functions.—For the action of the heart and arteries may appear strong, when at the same time there is great general debility, and to exhibit an active cathartic under these circumstances, would occasion prostration, and endanger the life of the patient. The circumstances which govern the employment of blood-letting, should, in some degree regulate the use of cathartics. Where the patient is much debilitated, none but the mildest laxatives, or injections are admissible; and in the advanced stage of the disease we should be particularly cautious against the employment of active remedies.

With respect to the medicines to be employed as cathartics and laxatives, there is a considerable choice and variety, according to the circumstances of the patient and the disease. Calomel and jalap is an old and favorite medicine with many practitioners, and its use is sanctioned by the precept and example of Dr. Rush; who in the yellow or bilious fever of Philadelphia, 1793, and in those of subsequent years, considered it almost a specific, and next to the lancet; or the second remedy in the catalogue of the curative means which he employed. It was not, however one or two doses that he found sufficient to answer his object. There is but little objection to calomel and jalap as a purge, provided the patient's stomach will retain them. Not unfrequently, however, they nausseate to such a de-

gree as to bring on a vomiting, by which they are entirely rejected. On such occasions I have often succeeded by making them into pills, directing two or three to be swallowed every half hour until the necessary quantity has been taken. From ten to fifteen grains of calomel with from twenty to thirty of jalap, according to the habit and constitution of the patient, may be given at a dose. But the medicine, which on many occasions, I prefer to the above, is calomel and castor-oil. The calomel should be given first by itself, mixed up in a spoon with syrup or molasses, and the oil immediately, or in a few minutes afterwards. On several occasions I have witnessed the superior efficacy of this purge to that of calomel and jalap; it is less nauseating to the stomach, is more free and copious in its operation, and is not attended with that pain and griping which frequently accompany the operation of calomel and jalap. Cream of tartar and jalap is also an excellent purgative on many occasions, and it is generally quicker in its operation than any other cathartic. About twenty grains of jalap and two or three tea-spoonfuls of cream of tartar may be given at a dose, and repeated, should the first not operate sufficiently.

During the operation of these purgatives, the patient should drink freely of thin warm gruel or weak tea.

Sometimes the irritability of the stomach is such as to forbid and prevent the exhibition of all bulky articles by the mouth. In such cases, in order to keep up the action of the bowels, we must have recourse to calomel, given either simply with syrup, or in combination with some aromatic; and its operation may be assisted by the use of injections. In general, calomel alone, is not sufficiently active to operate upon the bowels; and as cream of tartar is less nauseating than almost any other medicine, I have frequently prescribed it freely to assist the operation of calomel: besides, independent of any cathartic operation which cream of tartar may exert, in cases where the excitement or fever is considerable, it acts as an excellent febrifuge.

The high commendation bestowed by Dr. Hamilton on the use of purgative medicines in typhus fever, is calculated in many instances to be productive of serious and fatal consequences; and though it is of importance that the bowels, in all stages of the disease, be preserved free from morbid accumulations, and though the free and liberal employment of cathartics is proper and necessary during the early stage of bilious fever, yet when the patient

has become affected with the prostration of typhus or asthenia, the exhibition of an active cathartic would prove speedily fatal. I speak from experience, having more than once had occasion to regret the employment of a purgative under these circumstances in a torpid and constipated state of the bowels, and where the symptoms previously had not been alarming; yet two or three motions by stool has sunk the pulse and vital powers beyond the possibility of restoration. The more malignant the disease, the more liable is this to happen, and it is always safer to trust to gentle laxatives and the use of injections to preserve the bowels free from accumulations in the latter stages of the disease, than to hazard the debilitating operation of an active cathartic.

Dr. Rush, Dr. Chisholm, and several other modern physicians, besides giving calomel as a purgative, have recommended and exhibited it in large quantities in bilious malignant fevers, with a view of exciting salivation. There can be no doubt that in some cases, calomel may prove a useful remedy in the endemic fever of hot climates; but in its exhibition there are several circumstances to be kept in view; and to employ it merely with the design of producing salivation is a practice altogether empirical.

Most physicians who have witnessed much of the mercurial treatment must have observed cases wherein a salivation was effected, and which, notwithstanding, terminated fatally; others, again, where no salivation could be produced by the most liberal and excessive exhibition of this medicine, and yet the patients have recovered; and numerous other instances they have remarked in which the gums and mouth did not become affected by the mercury until after a complete crisis of the disease, and every symptom of the fever had disappeared. The truth is, that when the fever is slight, the skin soft and moist, and the pulse yielding and free from tension, it is not in general difficult to excite a salivation, and as this takes place the fever subsides; but it still remains a question whether in those instances the salivation is the cause or effect of the favorable change that has taken place; for when high inflammatory symptoms prevail, or when those of a typhoid character make their appearance, with a languid circulation, and a cool, dry and withered skin, it is either impossible to produce a salivation, or when affected, it affords no relief; the patient perhaps dies, or a slow and lingering recovery confines him for a long time to a sick bed.

This medicine was first brought into popular fashion as

a sovereign remedy in fever, by Dr. Clark, and the practice was afterwards improved and made more general, by the extravagant encomiums lavished in praise of its efficacy by Dr. Chisholm. From one to eleven ounces of calomel were given by Dr. Chisholm to patients in the fever of Granada, in 1793.—But the eulogiums of Dr. Chisholm in favor of excessive quantities of mercury in the Granada fever, come to us very much qualified by Dr. Stuart, who practised in the same disease. He informs us that from the strong recommendations of Dr. Chisholm, he was induced to give calomel a trial. "Sanguine in the expectation of benefit therefrom, but I am sorry to add that it did not prove an effectual remedy in my hands."*

When calomel is prescribed and exhibited in the general manner recommended by the stickler's for this medicine, without discrimination of the character and stage of the fever, or the age and habit of the patient, its injurious consequences cannot fail to predominate over its beneficial effects. The object of Dr. Chisholm was to produce a salivation, for which purpose he was some times under the necessity of exhibiting from three to four and even eleven hundred grains of calomel. I have above pointed out the circumstances of the patient as favorable or otherwise to the operation of mercury; and it must evidently occur to the reflection of every prudent and judicious practitioner, that when such immense quantities are required to produce salivation, there must be a condition of the system extremely unfavorable to the action of this medicine, and a state of the disease, which instead of being benefited, will be aggravated by it. The sad consequences of such injudicious practice were strikingly exemplified at New-Orleans, in the year 1812. Three companies of the first regiment of artillery were then stationed at the barracks in that city, of whom a great portion died with the bilious fever, (yellow fever if you please) and from the effects of mercury. According to the fashion of the times they were treated upon the mercurial plan, and with as much liberality of practice as even Dr. Chisholm himself could have desired: this *Sampson of the Materia Medica* was not prescribed by the weight and measurement of grains, but was given to the patient in a cup, and he was directed to eat it by the spoonful. The consequences may be readily imagined: few survived to tell the mournful story. It was said that mercury was not so effectual this season as

*Hosack and Francis' Amer. Med. & Phil. Reg. Vol. III. p. 199.

it had been on many other occasions: I should rather say that in some instances it had not proved so destructive.

By writers on the Materia Medica, mercury is classed and considered as a stimulant or tonic, general and permanent in its operation and effects, and promoting at the same time all the excretions of the body.

According to my own observation, I should say that such was its operation under certain circumstances of the constitution only.* Mercury, to be useful, should be employed in the early stage of fever; for if it be deferred until a late period of the disease, or until asthenic symptoms have made their appearance, its exhibition will be of doubtful utility, and will be very apt to prove highly injurious, by increasing the prostration and aggravating the disorder. This fact should be well remembered, as the result of much experience. It is well known that the first operation of calomel is to produce a greater or less degree of nausea, and a sensation of general lassitude, debility and depression, with a frequent, small and weak pulse.—Such being its effects, we must be aware that it cannot fail to prove prejudicial in all cases of fever where there is much prostration and debility, attended with a weak and languid circulation, and a cool, dry and unperspirable skin. This is an important fact to be constantly kept in view in the employment of calomel, for if exhibited under the circumstances here pointed out, the practice must prove dangerous or fatal to the patient. If his situation is such as to require stimulents, calomel, even admitting it to possess this property, must be too slow and sluggish in its operation to be of any service; and if its first and most obvious effect is to debilitate, it must prove directly prejudicial.

Except, therefore, merely as a means of opening the bowels, mercury should never be exhibited after typhoid or asthenic symptoms have made their appearance, and un-

* "Respectable physicians have asserted," says Dr. Currie, "that when salivation could be produced in the yellow fever, recovery was almost always the consequence. It may be said, perhaps, that where the power of the absorbents remains, and there is time for a salivation to be effected, the disease has been generally of a mild nature, and the recovery more probable from the first. But I may also remark, what has not before been observed, that salivation is accompanied by a more profuse perspiration from the surface, a circumstance which may diminish the febril heat and irritation."—*Currie on Water, p.* 384.

It was observed by Dr. Thomas Clark that in the East Indies, mercury, whether used externally or internally, almost always occasions an increased secretion of bile, notwithstanding a copious perspiration should have been kept up at the same time.—*Clark on the Nature & Cure of Fever.*

der these circumstances injections will be more proper than the exhibition of purgatives or laxatives by the mouth

There is a prostration of the system and a feebleness of the circulation which frequently take place in the early stage of fever, differing materially from the asthenia and exhaustion of typhus. In the former, the intellect is some times confused, and the patient affected with a degree of stupor, but there is less of that lethargic and unnatural slumber which takes place in the latter, and the countenance is, in a great measure, free from that fallen hypocratic expression which generally characterises the typhoid stage of the disease. The latter is the result of the progressing malignancy of the disorder; the former may take place from any sudden evacuation, but more frequently from oppressive and offensive accumulations in the stomach and bowels. This is a distinction of some importance in practice; for when this apparent debility of the system, and weakness and smallness of the pulse merely proceed from anxiety and oppression, occasioned by the foul state of the first passages, a moderate dose of calomel, aided in its operation by injections, will prove serviceable. With the same view, I have also sometimes employed emetics of ipecac. or white vitriol, with the most happy result.

There is still a condition of the system unfavorable to the employment of mercury, which remains to be noticed. When the fever is considerable, the skin warmer than natural, but dry, shrunk, and impervious to the perspiration, and the pulse hard and wiery, it is difficult to excite a salivation; and calomel, in such cases, is found to aggravate the symptoms. If, however, it is still persevered in, and the patient is able to endure the treatment, the character of the disease becomes changed, and a true mercurial fever is produced, with a small, hard, frequent, and wiery pulse, a dry and parched state of the skin, a swollen, dry and inflamed state of the fauces, exuding a disagreeable slimy mucus, but no salivation is produced. The physician, ignorant of the cause of the obstinacy and continuance of the fever, pushes the mercury to the extreme, and by persisting, kills his patient.

Where a large quantity of mercury has been given in the course of the fever without showing its effects upon the salivary glands during the continuance of the disease, it often happens that a violent ptyalism breaks out upon the subsidence of the fever, which proves more tedious and distressing than the original disease. This salivation is sometimes attended with great swelling of the face,

throat, tongue, and salivary glands; ulcerations of the mouth, fauces, and inside of the cheeks; erosions of the blood-vessels, producing hæmorrhagie, and ending in some instances, by extensive slaughings, mortification and death. Sometimes the patient survives with the loss of the uvula, or of a portion of the inside of the lips and cheeks, which, in healing, become united to the gums, impeding the motion of the jaws, and rendering speech and mastication difficult. To all which, may be added, the loss of teeth, from the ulceration, decaying and sloughing of the gums, not to mention the injury done to the constitution.* To allay and subdue this violent salivation, the bowels should be kept freely open by the daily use of sulphur, in the quantity of a tea-spoonful two or three times a day; the mouth should be washed frequently with a solution of alum, to which Peruvian or oak bark may be added, or should the mouth be very tender, sage tea and honey; and the internal inflammation of the mouth or throat may be allayed by the external application of blistering plasters. All cold drinks and exposure to the cold air, and bathing with cold water should be avoided during the continuance of the salivation.

It is well known that in scurvy the smallest quantity of calomel produces violent salivation, and that its repeated exhibition soon destroys the patient. Persons of scorbutic habits, as indicated by offensive breath, spongy, livid gums and rotten teeth, from which the gums have partially separated and decayed, are likewise easily thrown into a salivation; and to such, mercury should be cautiously exhibited in fever.

I have sometimes been induced to believe that calomel has the property of altering the colour and appearance of the evacuations from the bowels; giving them a dark, shining and bilious appearance, when at the same time, there might not have been any redundancy of bile in the system. This I am the more inclined to believe from observing that the discharges produced by other purgatives, though free and copious, did not exhibit the same appear-

* Matthias, speaking of the effects of mercury in the syphilis, says, "Sometimes a fever ensues, with inflammatory rheumatic swellings of the face and extremities; at others, it produces local inflammations, supurations, ulcerations, and even gangrene, especially about the cheeks and fauces: the intestines are very easily affected by it, and then violent fluxes, with great pain and discharges of blood ensue. Mercury appears to destroy the energy of the nervous system, producing weakness, tremors, palsies, epilepsy and mania.—*Matthias on the Mercurial Disease*, p. 18.

ance, unless there was at the same time a morbid redundancy of excrementitious matters in the bowels. A question may arise, however, whether this property of calomel is not owing to its greater power in acting upon the biliary organs, and thereby emulging more effectually the vitiated secretions.

Though it cannot admit of a question that the injudicious use of calomel has been productive of great and serious injury, yet the authority and observation of many respectable physicians, both in America and the West Indies, stands in vindication of its utility when employed with the view, and to the extent of producing salivation. By as many, and equally respectable physicians, it is entirely rejected in billious fevers. The impartiality of justice and the truth of experience would incline us to occupy the middle ground: carefully avoiding that error and empiricism in physic which would inculcate the belief that mercury is a specific in endemic fever; at the same time bearing in mind the limited sphere of its utility and safety, and the cautions already enjoined. When none of the circumstances pointed out forbid its use, it may be given as an apperient and diaphoretic in combination with nitre and antimonial powder. The proportions I make use of are from one to three grains of calomel, three of antimonial powder and eight or ten of pulverised nitre every three hours. When the fever is disposed to assume a low, nervous or typhoid character, from three to five grains of camphor may be added to each powder.

The next remedy in point of importance, is the cold bath. The ancients were acquainted with the use of cold water, both as an external and internal remedy in fever. Like many valuable discoveries and improvements, however, it remained for a long time neglected, until revived in later times, it was employed as a modern remedy in an epidemic fever at Breslaw in Selicia about the year 1737. De Hahn relied upon the use of the external application of cold water in the treatment of this disease, and its superior success was manifest when compared with the practice of other physicians who did not employ it. From Breslaw the practice was introduced into some of the neighboring countries. From some cause, however, probably from the circumstances under which it should be used not having been well understood, cold bathing never became general until the attention of physicians was again directed to the subject by some West India practitioners.

We are informed by Savary, in his letters on Egypt, that

the inhabitants of the Said, cure the burning fevers to which they are subject, by drinking freely of cold water, and bathing in the Nile.

It is related by Morandi, a Venetian physician, that several sailors at Constantinople who were seized with the plague, *(or epidemic fever)* in a state of derangement, threw themselves into the sea, from which being rescued, they were speedily cured.

Similar instances of success are mentioned by Desgenettes as happening to some of the French soldiers, from plunging into the Nile in Egypt, and into the sea at the siege of Jaffa.

As animal nature when left to itself, generally has recourse to those means that are most conducive to its comfort and agreeable to its feelings, and considering the instinctive cravings of febrile patients for cool drinks and cool air, it is rather a matter of astonishment that a remedy so well adapted to the feelings and situation of persons laboring under fever, should have been so long neglected; nor should we be surprised that untutored savages in this particular should possess an advantage over the philosophical sceptics of civilized nations. We are accordingly informed by Mr. Bruce in his travels, that the inhabitants of the island of Massuah cure the most violent bilious fevers by suffering the body to lie for some time in a bed of cold water.

Dr. Wright, who had practised for several years in the island of Jamaica, published 1786 an account of the successful employment of the cold bath in several cases of fever. To the last mentioned physician, succeeded several other European and West India practitioners, as Jackson, Gregory, M'Lean, Gerard, Brandreth, who illustrated by their success the superior advantages of this remedy. In Europe, Dr. Currie of Liverpool, has made extensive and accurate observations on the subject, and has much improved and systematised the practice. But as the use of cold water, both externally and internally in fever, is now admitted as a general remedy in medicine, it is unnecessary to enumerate the various authors who have since written in support of its utility.

The cold bath is at all times proper when the skin is hot and dry, whether at the commencement or in the progress of the disease. The colder the water, the more effectually it answers the object. And in order to reduce its temperature below the natural standard of the well or fountain, a portion of common salt may be dissolved in it

immediately before it is poured upon the patient; this will also render a less quantity necessary. In general, two common water bucket fulls at a time are sufficient.* The most proper period for employing the cold bath is when the hot stage is at its height; though it cannot be improper any time when the skin is dry and the temperature of the whole body is above the natural and healthy standard. After the bath, the patient is wiped dry, put in bed and covered up lightly. Should the heat again become excessive without the appearance of perspiration, the cold bath should be repeated, and so on, should it be necessary, for several times successively in the course of the paroxysm, until the sweat breaks out and the fever subsides.

Sometimes the cold bath will not avail until after venesection; and in general, whenever the excitement is sufficient to require the cold bath, blood-letting will be previously necessary. By the aid of these two powerful remedies the most violent and ardent fever may in general be subdued and brought to a remission. I have known the cold bath repeated several times in the course of a few hours without procuring more than a temporary abatement of the fever, which yielded immediately upon the employment of the cold affusion after copious venesection. The most obvious effect of the cold bath is to reduce the temperature of the surface, to diminish the force and frequency of the pulse, soften and relax the skin, and to bring about a flow of perspiration. In the majority of cases, a flow of sweat follows its employment, although I have known it highly serviceable when no sensible perspiration was produced by it. Perspiration, however, commonly takes place after two or three repititions, and in many cases, once is sufficient to relieve the paroxysm and produce a remission of the fever.

Some attention should he paid to the manner of employing the cold bath, and to the quantity of water affused in order to ensure its good effects. If the patient is much fatigued by the removal and exertion, or if too large a quantity is applied at once and for too long a time, but little benefit will be derived to the patient, and danger is incurred of converting a valuable remedy into an injurious agent. When the temperature of the body is much re-

* In order to avoid the fatigue of removal, I generally direct a large wash-tub to be brought to the bed side of the patient, and placing a narrow strip of board across it, he is seated upon it so as to let the water run in the tub: the water is poured gradually upon his head and shoulders so as to wet the whole body.

duced below the natural standard by the too copious affusion, or too long continued application of cold water, the reaction is slow and difficult. It is to the sudden impression upon the system and the change in the state of the cutaneous vessels produced by the cold bath that its benefit is to be ascribed. It has been previously observed that sweat is the most natural and ordinary crisis of fever; and as the cold bath seems chiefly to owe its beneficial effects to its power in promoting this salutary discharge, the presumption is that the beneficial operation of this remedy consists in producing a state of the surface and general system favorable to the flow of perspiration.

Cold bathing is more sudden and powerful in its effects than any other remedy in the whole circle of medical prescription. Let a person be burning with never so violent a fever, with a skin hot and parched and almost intolerable to the touch, a pulse, frequent, strong and hard, the heart throbbing and palpitating with such violence as to jar and agitate the body, the eyes blood-shot and watery, and a violent pain in the head—the affusion of one or two buckets of cold water will instantly mitigate these symptoms; the heat will be reduced to, or even below the natural standard; the pulse will be rendered slower and softer; the pain in the head will be diminished or entirely relieved, and the patient will express his satisfaction that he feels infinitely better. Though the cold bath relieves the patient, subdues the morbid temperature, and reduces the pulse in frequency and force, yet it does not put an immediate stop to the progress of the paroxysm. In a short time after its use the fever will be found to rise again, and if a perspiration does not soon appear, the heat and febrile action will resume their former violence. The utility of the cold bath seems to consist in producing that state of the surface and of the general system favorable to the appearance of the perspiration, and to the solution or crisis of the paroxysm, which is never the work of a few moments, but the result of time and the progressive developement of the symptoms. The operation and effects of cold bathing are the same in every form of the endemic fever, whether of the intermitting, the remitting, or continued type; that is, it procures a tempory abatement of the symptoms, and facilitates and expedites the solution of the fever. These remarks are made in contradiction to the position of Dr. Giannini, an Italian physician, who affirms that the cold bath, by way of immersion of the body in cold water, "puts an immediate stop to the paroxysm, when employed in the

hot stage of an intermittent," than which nothing is more erroneous and untrue.

From the property which cold bathing possesses of diminishing the temperature of the body and of lessening the force and activity of the circulation, it is evident that it is inadmissible in those cases where the heat of the body is below or only equal to the natural standard of health, and where the circulation is weak and languid; and that it is unsafe in cases of prostration or in the latter stages of typhus. In such cases permanent debility and even death might be induced by it, on account of the system being too much debilitated to possess the power of reaction.

In some instances where the cold affusion affords but a temporary mitigation of the symptoms, the heat and restlessness returning, without the appearance of perspiration, soon after the patient is lain in bed, or when he complains of faintness and inability to sit up or be moved, the heat at the same time being considerable, I have found in such cases the best effects from wrapping the whole body in one or two linen sheets, wet with cold vinegar and water, removing them from time to time as they become hot and dry. In debilitated patients, also, who could not well endure the fatigue of sitting up to receive the cold bath, I have directed them to be laid upon the floor, or upon a naked cot, and the cold water to be poured over them gradually until the temperature and excitement were sufficiently reduced.

It is not necessary, however, in order to ensure the good effects of this remedy that the temperature of the body should be much increased, and in many cases of slow and lingering fever, in which there is never any distinct remission, although the fever never rises high, the affusion of water of about the temperature of 75° I have found an admirable remedy in bringing about a complete intermission, so as to admit of giving the bark with safety and success.

As the benefit of the cold bath seems to consist in reducing the temperature of the body and in producing perspiration, it is obviously unnecessary whenever the skin is soft and perspirable, and much less when the body is wet with sweat. Perspiration itself is a cooling process, and moreover, an outlet to the morbid matter. Cold bathing, therefore, when the patient is in a profuse perspiration, cannot fail to prove prejudicial, though the temperature of the body at the time of employing it may be considerably above the healthy standard. Besides, the heat of the body is often kept up in such cases by the injudicious treatment of the friends and attendants, who from a mistaken fear of the pa-

tient's taking cold, or suffering a check to the perspiration, oppress him with the confinement of closed doors and windows, and load him with bed clothes; and upon removing the load of clothes and permitting him to breathe the free air, the heat speedily sinks to its proper temperature: cold bathing under such circumstances would give a sudden check to the perspiration, and produce an alarming and dangerous diminution of the animal heat.

When there are symptoms of congestion or inflammation of any of the internal viscera, as of the lungs, liver, &c. an objection may arise as to the propriety of the cold bath and when there is any considerable inflammation of some organ present, it would not be advisable to have recourse to this remedy. But it is not uncommon in the endemic fevers of warm climates for the patient to be affected with more or less cough during the cold as well as at the commencement of the hot stage; but unless this is also attended with a fixed pain of considerable violence it is to be regarded merely as a symptom of irritation, and affords no objection to the employment of the cold bath.

In the use of this remedy, attention should be paid to the state and character of the fever, and to the symptoms of local congestion or inflammation. If the disease is advanced in its progress; if the patient complains of great internal distress, with pain in the chest, stomach or bowels; if he is predisposed to consumption; or of a slender, feeble and delicate habit, the cold bath should be avoided; for, though it may procure a temporary relief under such circumstances, there will be reason to apprehend a permanent injury, which may result in the death of the patient. These remarks are not made upon speculative inferences, but are the result of observation. I know a contrary doctrine has been lately taught, but those who embrace it in theory should be careful how they carry it into practice; and they should bear in mind that the fine spun hypotheses of the closet, which attempt to apply the supposed modus operandi of every remedy to their explanation and support, will often be found defective and dangerous at the bed side of the patient. From the operation of remedies of tried and acknowledged utility, we may reason upon their operation. But to enforce the application of a doubtful or untried remedy, by arguments drawn from mere speculation and hypothesis, is inverting the order prescribed by procedence and discretion.

The effect of cold bathing may be increased by placing the lower extremetees of the patient in a tub of warm water,

and whilst in this situation dashing cold water upon the superior parts of the body.

When the fever is high, I always resort to bleeding previously to having recourse to the cold bath; and if by the use of the former a free and general perspiration is promoted, the cold affusion is postponed till the rise of the fever and the dryness of the skin render it necessary.

An objection might arise to the use of the cold bath in cases where the patient has recently taken calomel; but this objection is entirely groundless. I have on many occasions employed the cold bath on patients to whom calomel had been daily exhibited, without having experienced any injury, but who, on the contrary, were as much benefitted by the cold affusion as those to whom no mercury had been given. It is well known that a check given to the perspiration, or the taking cold, as it is called, in persons who have been taking mercury determines the action of this medicine to the salivary glands, and occasions a profuse and sometimes dangerous salivation: but it has been previously observed that the operation of the cold bath is to produce perspiration, and that no danger, therefore, can be apprehended from it, when employed with the observance of the cautions before pointed out.*

* For further particulars with regard to cold bathing the reader is referred to the communications of Dr. Wright in the London Med. Jour. and to the 7th Vol. Medical Facts and Observations; Currie's Medical reports on the effects of water cold and warm; Dr. O'Leary's communications in testimony of the good effects of cold water in *typhus icterodes*, Lond. Med. Jour. Vol. xvi p. 490, and the communications of Dr. Seldon and Dr. Whitehead of Norfolk, Med. & Phys. Jour. Vol. x p. 266. The drinking of cold water, says Dr. Currie, "in fevers is regulated by the same circumstances as the affusion." He thinks that the fatal effects of drinking cold water after severe exercise, is owing to the body being already in a cooling state from the perspiration and fatigue that have been induced; and that if taken while the body is very warm, and before it is in a sweating state, no ill effects would happen, contrary to the doctrine of Dr. Rush. This opinion is probably erroneous, and the manner in which I would account for the fatal consequences is as follows. In the first place the whole body has become excessively overheated by exercise,—secondly, as the effect of this exercise there has been produced a greater or less degree of exhaustion and debility,—thirdly in consequence of this exhaustion and debility, the body is less able to resist hurtful impressions from external causes, or to exert a vigorous reaction,—fourthly, the extensive sympathy of the stomach with every part of the body, and particularly the heart and arterial system, for we always find a sick and weak stomach attended with a weak and frequent pulse,—fifthly, the sudden impression of the cold water upon the heated and debilitated stomach, reducing its temperature and destroying its tone before it has power to adapt itself to the sudden change and resist the impression,—sixthly, this attony in the stomach communicates itself to the heart and puts a sudden stop, or gives a check to the circu-

When as is often the case, the heat is unequally distributed, being on some occasions more intense at the pit of the stomach, on others in the head and extremities, the application to these parts of cloths wet with cold vinegar and water will be found both soothing and beneficial; it allays the distressing sensation of heat in these parts, renders the temperature more equible tends to subdue the paroxysm, to produce perspiration, and to procure a remission or intermission of the fever. When there is a burning heat at the stomach and bowels, whilst at the same time the feet and legs are reduced below the proper temperature, the latter may be immerced in a tub or bucket of warm water, and cloths wet with cold water or vinegar may be applied to the region of the stomach and bowels; this is a practice from which I have sometimes experienced the greatest benefit. Such is the sympathy which exists between the different parts of the body and the stomach, that, on many occasions, cold applications to the region of this organ alone, are found to possess a wonderful efficacy in subduing fever, and reducing the general temperature. Considerable relief may also be derived from bathing the feet and hands in cold water or vinegar, when the heat of these parts is much or unequally increased above the natural temperature.

I have in some cases of prostration to which I have been called upon emergency, found the pulse frequent, small, and scarcely perceptible, whilst at the same time there was a caustic burning heat of the forehead and in the region of the stomach and bowels, with a preternatural coldness of

lation; whence ensue the various dangerous and fatal phenomena. It is well known that the body is more vigorous and active in the morning, and the circulation stronger than towards evening, more espesially if the person has undergone severe exercise. Hence cold bathing is beneficial in the morning, bul sometimes dangerous at night: Hence also Alexander nearly lost his life from bathing in the cold waters of the Cidnus after a hard day's march: whereas had he bathed in the morning, while the body was free from fatigue and the circulation vigorous, no ill effect would have ensued. In simple excitement, unaccompanied by exhaustion there is no danger from exposure to cold. Hence, as Dr. Currie observes, "after the heat of the body is increased two or three degrees in the hot bath, it is not only safe, but refreshing, to plunge into the cold bath, as I have repeatedly experienced. A practice of this kind prevails, as is well known, in Russia. We may therefore safely infer, that in making these singular transitions, the heat of the Russian is in the first instance increased beyond the natural standard; and it is to this increase that the safety as well as the agreeableness of the practice, is to be attributed; and from all these facts we may conclude, that, when the actual heat is considerably increased and the body is not weakened by fatigue, even the presence of profuse perspiration will not render exposure to a certain degree of cold dangerous."—*Currie on Water, p.* 101.

the extremities, and a wandering and derangement of mind; yet even from such an unpromising condition I have seen the patient recover. My plan is to diminish the morbid heat of the head and of the central parts of the body by applying to the forehead and to the region of the stomach and bowels linen cloths wet with cold water, and to restore the warmth of the extremities by immersing them in a vessel of hot water, and by the subsequent application of warm bricks should it be necessary, and at the same time raising the sinking powers of the system, by the frequent exhibition of warm brandy toddy, or wine and water, in the quantity of two or three table spoonfuls at a time every few minutes till the pulse in some degree revives.

When the patient is of a delicate constitution, where the fever is not very acute, and where there is a disposition to prostration and typhus, the affusion of tiped water may be substituted for the cold; its power though considerable in subduing the excitement, is not equal to that of the cold affusion, and as it gives a slighter shock to the system it is better suited to debilitated cases that are not able to endure the cold bath.

When the heat of the body is not sufficiently increased to require the cold affusion, I have found considerable benefit from sponging it with a mixture of vinegar and water, with sometimes the addition of nitre to increase its virtues. For the same purpose any of the vegitable or mineral acid may be employed; frictions with lime juice or dilute muriatic acid are especially useful and refreshing. In a communication from James M'Gregor, superintendant surgeon of the British army in India, he says that "in the pest houses of the Indian army we were at first very unsuccessful, and a trial was given to a variety of modes of practice. I find on examination of the report, that bathing with a solution of nitric acid, and sponging the surface with vinegar and water, and lime juice and water, were attended with the best effects." Notice is taken of a new method of cure pursued by the physicians of St. Domingo, extracted from the first number of the *Journal des officiers de Sante de Saint Domingue;* which consists in rubbing the body all over with fresh lime juice or lemon juice. Dr. Victor Bally relates a case of its successful employment in the most aggravated form of the disease.* Dr. Brandreth of Liverpool, giving an account of the benefit of washing the body with cold water and vinegar, in typhus fever, ob-

* Ffirths' Dessertation on the contag. of the Malig. Fever. Phil. Med. Mus. vol. 1, p. 115.

serves, "I generally order it to be done night and morning, with a large sponge. They usually express great pleasure from its effects, and a sense of great refreshment. It immediately lessens not only the heat, but in a singular manner the hardness of the skin. It diminishes the frequency of the pulse, and often lessens, nay, sometimes removes for a time the delirium. I have known patients who refused not only medicine, but every kind of food, readily prevailed on, after washing, to take whatever their friends offered."† Dr. Moises gives a flattering account of the advantages derived from ablutions with vinegar both in typhus and synochus ;‡ and remarks that he has employed it both in military and private practice with the most marked advantage, "the happy result," says he, "not only confirms the beneficial influences of this acid, beyond any other medicine with which I am acquainted, but has led me to consider it as deserving the serious attention of the profession, not only in those diseases, but in all others which by their analogy may afford the same obvious indications of cure. In two desperate cases attended with vibices a cure was thus effected. The acetous ablution was repeated every 3d hour, so as to consume from four to six pints of vinegar in the course of the day and night. That its powers are anti-sceptic and astringent there can scarcely be a shadow of doubt; and that it may form a *tertium quid*, destructive of contagion, I am led to infer from repeatedly, I might say uniformly observing, that, ceteris paribus, when it had been liberally used, the influence of contagion has appeared very limited, or altogether destroyed."

Vinegar was used as an external remedy in fever by Galen, who applied it till inflammation of the skin was produced.

Cold drinks are proper with the same view and under the same circumstances which authorize the employment of the cold bath; that is, during the hot stage of fever, or whilst the temperature of the body is above the natural standard. In the cold stage of fever the drink should be warm, and in the sweating stage the temperature is not material, provided it is not too cold, which is seldom the case in hot climates; and whilst the fever is at its height, the patient may drink freely of cold water acidulated with cream of tartar or lime juice, it cools the body generally, and favors and promotes the flow of perspiration.

† Med. Comment. vol. 14, p. 382.
‡ Med. & Phys. Jour. vol. 7, p. 337 & seq.

The circumstances of the patient, rendering warm bathing necessary or proper, are different from those which authorise and require the use of the cold bath. Where warm water is applied by affusion it has an effect in reducing the temperature of the body; but being less permanent and powerful in its effects, it can never properly supercede or supply the place of the cold bath, except in slight cases, and under circumstances of delicacy of constitution and debility which would forbid the application of cold water.

The effect of warm water, however, when applied to the body by immersion, so as to surround and envelope it, is different from that of aspersion or affusion; and it is only under circumstances of debility, exhaustion and reduced temperature of the body, where the skin is dry, cool and insensible, or cold and damp, and the circulation languid, that the warm bath, (by which is understood immersion of the body in warm water,) is admissable. The warm bath soothes and allays the irritation of the nervous system, softens the skin, opens the pores, promotes perspiration, increases the activity of the circulation in the smaller vessels, overcomes their torpor, and restores, in some degree, their lost energy and tone, and thereby raises the temperature of the surface to the proper height. Dr. Brandis, in his treatise on the use of the luke-warm bath in fevers in general, and particularly in those called slow nervous fevers observes that "the principle effect of the warm bath in fevers is good in general, since it takes off the spasm of the skin, and those parts sympathising with it, increases the excretion of the skin, promotes the flow of blood through the vessels, and moderates the action of the nervous system, but without in any way diminishing the vital power or irritability. Such is the opinion of Cullen, Salle, and of Marcard himself, where he proves that the warm bath does not debilitate." From the circumstance of its having been observed that the pulse of a person in a warm bath sometimes falls sixteen or twenty beats in a minute, it is inferred by Dr. Marcard, and others have entertained the same opinion, that the warm bath sometimes causes a diminution of the vital principle. Dr. Brandis, however explains this phenomenon in a different manner. "A free circulation in the smaller vessels of the surface," says he, "must diminish the flow of the blood to the heart; now the stimilus which excites the heart to action being less, its contractions become less frequent, though without the smallest diminution of the vital principle."* There can be but little doubt that could

* Duncan's An. of Med. vol. 1, p. 78.

the warm bath be employed in cases of debility, exhaustion, prostration, and torpor, which frequently take place in fever, without fatigue and exertion to the patient, so as not to cause a still greater exhaustion, this remedy would on many occasions prove highly beneficial. But it unfortunately happens, that the fatigue of shifting the patient's linen and his movement to and from the warm bath, often overbalance the benefit derived from the immersion. In determining upon this remedy, therefore, in cases apparently desperate, these circumstances are to be taken into consideration. One great reason of the failure of the warm bath, in so many instances, is the circumstance of its being put off till the last extremity, and then resorted to as a doubtful remedy, the straw of a drawing man. In cases of sudden and great prostration and sinking of the vital powers I have seldom had recourse to it; and for two strong reasons, 1st, In most cases it is not convenient to procure an apperatus or trough suitable for the purpose; 2d, The fatigue and exertion to the patient in administering the remedy rendering its utility doubtful, or rather affording an argument against it. But against the immersion of the extremities in warm water there can be no objection, for the remedy can be applied with little or no exertion to the patient. For this purpose the body may be moved a little towards the foot of the bed, so as to admit of the feet hanging out and being immersed in a bucket of warm water, or the vessel may be placed in the bed, by bending the legs to a sufficient angle with the body.

In slow, lingering and protracted cases, attended with debility, torpor and obstructed perspiration, the warm bath is a useful remedy. Tepid, or luke-warm water should be used, as it softens and relaxes the skin more than hot water, and does not exhaust by over stimulation.

Considerable difference of opinion has existed with respect to the nature both of the cold and the warm baths; and by a strange perversion the former has been called a stimulant and the latter a sedative. Agreeble to every known property of a stimulus, heat possesses this power in an eminent degree. If heat, therefore, is a stimulus, which it is presumed none will deny, and cold is a diminution of heat, it necessarily and logically follows that cold is a sedative, or an abstraction of stimulus in proportion to the diminution of heat or caloric. This is not a mere matter of idle speculation, destitute of practical utility, it is the establishment of a rational and scientific principle in medicine. If cold is a stimilus why is it found beneficial in the hot

stage of fever, where our object is to abstract all unnecessary stimuli, and where we have recourse to means the most directly sedative of any within the routine of the healing art, viz. blood-letting? If cold is a stimulus, and so useful in the hot stage of fever, we should, by the soundest principles of analogy, be authorized in the exhibition of other stimuli with the same view; the argument would appear conclusive and unanswerable: and the inference necessarily follows that cold and ardent spirits, are highly beneficial and requisite in the hot stage of fever. It is true there are stimuli of different degrees of power and activity, and it might be contended that cold is a moderate stimulus. But as we judge of the nature of agents by their effects upon the body, we usually call those stimuli which increase the excitement and rouse the energy and mobility of the muscular and nervous systems. Now we know that this is not the case with cold; as is strikingly exemplified in the application of the cold bath, which reduces the febrile excitement, subdues the heat, and diminishes the strength and frequency of the pulse, in the same manner as blood-letting, but more suddenly. And from what we are capable of observing we can have no hesitation in believing, that the exposure of the body to a medium of absolute frigidity would instantly extinguish every vestage of vitality. But the action of cold, it is said, strengthens the body, therefore, it must be a stimulus. And how stands the reverse of this proposition? The operation of heat weakens the body, therefore, heat must be a sedative. We must be aware, however, that it is a well known property of all stimuli that their excessive operation on the body exhausts the power both of the muscular and nervous systems, and produces debility and attomy. And on the contrary the abstraction of stimuli increases the excitability of the sensible and moving fibre.

During the intervals of the operation of cathartics the patient may take with advantage a febrifuge powder mentioned under the head of mercury, every three hours.

To assist in promoting perspiration I at the same time direct a tea-spoonful of the spirits of nitre and cream of tartar every two hours, alternately, so that one of them may be taken every hour. Cream of tartar and water, tamarind water, diluted lime juice, molasses and water, vinegar and water, may all be used as common drinks.

An excellent febrifuge will be found in the use of the alkalies and lime juice given in a state of effervescence. Of the alkalies the most agreeable is the carbonate or super-

carbonate of soda; fifteen grains of this may be dissolved in a tumbler, in about a table spoonful of water, and when the patient is ready to take it, about two table spoonfuls of lime juice may be poured from another tumbler into the one containing the soda, and the patient is directed to take the mixture immediately, whilst it is in the act of effervescence. There should always be rather more acid than is necessary to saturate the alkali. The cabonate of potash (salts of tartar) may be substituted for the soda, where the other cannot be obtained. In order to increase the appirient and febrifuge qualities of the effervescing mixture I frequently add cream of tartar, mixing a tea spoonful in the tumbler containing the lime juice. This mixture may be taken every hour, or every two hours, according to the degree of fever. The spirits of nitre is also a useful febrifuge and diaphoretic; the virtues of which may be increased by adding about fifty drops of antimonial wine to an ounce of the spirits of nitre; giving of the mixture a tea spoonful every hour, during the continuance of the fever. Where the stomach is irritable and disposed to reject the substances received, we may sometimes add a little paregoric, or a few drops of laudanum to the effervescing draught, which will at the same time increase its sudorific powers. As answering the purpose of the carbonate of soda, salts of tartar and lime juice, the Seitlitz or soda powders; as they come prepared, may be employed with advantage; dividing the papers into two or three portions, so as not to oppress and overload the stomach. To render them the more agreeable a little loaf sugar or syrup may be added to each dose.

My reason for employing this variety of sodorific remedies is that they mutually assist the operation of each other; no sudorific alone will be found so effectual as in combination with others, which, though possessing in themselves, inferior efficacy, increase the virtues of the more powerful.

To promote perspiration, is a leading indication in the treatment of fever; and to effect which, all the remedies that have been mentioned have a strong and natural tendency. There is a due medium in the temperature of the surface, as well as vigor in the exhalents, necessary to salutary perspiration: where the former is too high or too low, or the latter too weak, this evacuation is either suppressed, or if it flows from relaxed and debilitated vessels, cannot fail to prove prejudicial. Where the suspension of the perspiration proceeds from excessive excitement we have re-

course to bleeding, vomiting, purging, the cold bath, and other febrifuge remedies: where profuse and morbid from relaxation and debility, we endeavor to restore it to a healthy state by moderate covering, bark, wine and the mineral acids.

A warm and natural perspiration, though free and copious, is safe and salutary, and should be encouraged and supported: profuse, cold, slippery and morbid sweats, attended with weakness and prostration of the system, should be checked and subdued.

It is proper to remark that there is a very material difference between salutary and morbid perspiration. Perspiration, to be servicable, requires a due degree of tone and vigor in the exhalents, whereby the perspirable matter alone may be discharged, but when the cutaneous vessels are debilitated and relaxed the serosity of the blood exudes from their orifices, and the perspiration, instead of proving servicable, drains off the natural juices of the body, wastes the solids and exhausts the patient.*

* Even the sweating sickness of England was cured by promoting perspiration. In illustration I will here subjoin a short account of this disease in relation to this subject, as described by Hollinshead. "The sweating sickness of England appeared there at different times from 1483 till 1554. The discription given of it by Caius is terrible, like the plague at Athens. It was cured by sweating the patient twenty-four hours. In some there was a necessity to repeat the sweating." (See Dr. Friend's History of Physic, part 3, p. 333.) At length by diligent observation of those that escaped, a remedy was found for that mortal malady, which was this: if a man was taken in the day time with the sweat, then should he streight lie down with all his clothes and garments, and continue in his sweat four and twentie hours, after so moderate a sorte as might be. If in the night he chanced to be taken, then should he not rise out of his bed for the space of four and twentie hours, so casting the clothes that he might in no wise provoke the sweat; but lie so temperate that the water might distill out softly of the own acord, and to abstaine from all meate, if he might so long suffer hunger; and to take no more drinke, neither hot nor cold than would moderately quench and assuage his thirsty appetite. Thus in luke warm drinke, temperate heate, and measurable clothes, many escaped. Few which used this order after it was found out, died of this sweat. More one point diligently above all others in this cure is to be observed, that he never did put his hands out of bed to refresh or cool himself, which to do is no less jeopardie than short and present death." We are further told by the same author that this disease, "began about the one and twentieth of September, and continued until the latter end of October, being so sharp and deadlie, that the like never was heard of since man's remembrance before that time; for suddenly a dreadful burning sweat so assailed their bodies and distempered their blood with a most ardent heat, that scarce one among a hundred did escape with life; for all in a manner as soon as the sweat took them, or within a short time after, yielded the ghost."—*Hollenshead, p.* 763.

In the progress of the fever cream of tartar, in the quantity of two or three tea spoonfuls at a time will be found a useful laxative to open the bowels, and an excellent febrifuge, acting as an apperient, diuretic and diaphoretic. Sometimes it will be rendered more agreeable by the addition of a little sugar and lime juice, and to render its apperient powers more active senna and manna may be sometimes added with advantage.

The state of the stomach is much influenced by the condition of the surface of the body: where this is moist, with a warm and fluid sweat, the stomach is generally composed; at least, the continuance of the perspiration has a tendency to relieve the irritability and sickness of the stomach. And the practitioner has, probably often remarked that the patient is stronger during the continuance of the perspiration than he was before. Perspiration is one of the most important functions of the body, which can never be suppressed, even for a few hours, without producing disorder in the system. The retention of the perspirable matter soon throws the body into an ardent fever, and deranges every part of the animal economy. If such is its importance to the healthy condition of the body, how great must be its influence and benefit in those diseases which owe their existence to a vitiated condition of the animal fluids? Even the venerial, the most loathsome and horrible of all diseases, is often cured by the use of such remedies alone as promote perspiration. A very favorite remedy for the plague in Syria is frictions with warm oil over a kettle of coals in a close room, which soon brings on a copious perspiration, and cures the disease.*

* Sydenham found when a sweat was kept up for twenty-four hours, it was the best cure for the plague and pestilential fever. He says that the patient is always stronger when the sweat flows; that several, by his advice, who were kept in a sweat for twenty-four hours, so far from complaining of greater weakness in consequence, that they declared that in the same proportion as the superfluous humors were carried off, they perceived their strength increase. That while the sweat continues, the patient judges himself in a fair way of recovery, and, in the opinion of the attendants, seems in no further danger; but as soon as the sweat ceases, and the body begins to dry, he grows worse, and a kind of relapse is occasioned. He directed the sweat to be kept up for twenty-four hours, by draughts of sage posset drink, taken now and then, strictly cautioning against wiping off the sweat, and not allowing the patients linen to be changed, however moist or foul it was, until twenty-four hours after the sweat was gone off; during which time he was advised to be careful not to get cold, but to let his linen dry on his body, to take all his liquids warm, and continue the sage posset drink. The next morning a purge was given. He says he did not loose a single patient after he began this process.

Cajus, after much unsuccessful experience found that the cure of even

Blistering is often serviceable in the endemic fevers of the southern states, as well as in those of sickly and tropical climates, more particularly where the patient is affected with local pains or distress, either in the head or stomach. The application of a moderately large plaster to the region of the stomach, will often be found of essential service in relieving the sickness, vomiting, and burning sensation of that organ. Nor when the symptoms are violent and severe, should we wait until these distressing affections have come on, before we have recourse to this remedy: the preceding steps which have been taken, such as bleeding, vomiting, purging, and the cold bath, will, in all probability, have reduced the excitement sufficiently to remove all apprehension of its being aggravated by the application of the blistering plasters. Besides, even in cases of high febrile action, this apprehension is more imaginary than real; in all pleuritic cases, I have uniformly had recourse to blistering after blood-letting, whether the latter operation had or had not subdued the excitement, and with the best effect; the disease yielding upon the drawing of the blister. In fever, this remedy, to be of service, should be employed at a pretty early period of the disease. Many physicians are in the habit of only having recourse to blistering when the symtoms of approaching dissolution have come on;—when the pulse has sunk, the body become cold or reduced in temperature, and alienation of mind and stupor have seized upon the patient. Although their application under these circumstances may do no harm, we can scarcely flatter ourselves that they can be of any material service. But at the same time, that there can be no objection to their employment, there is still a prejudice in their favor, and whether this is well or ill founded, no injury can result in complying with it. I have, moreover thought, that the pain and excitement produced, and the quantity of water discharged by extensive blistering, has often been instrumental in bringing about a salutary change in cases apparently desperate. If blistering is a serviceable remedy, of which I have no doubt, it is manifest that it will be most

the sweating sickness, consisted in keeping the patient in bed, and promoting a continued and protracted sweat for twenty-four hours.—*De Ephem. Britan.* p. 110. And Helmont asserts that all fevers may be cured by sweating. For this purpose he employed the *diaphoretic precipitate of Paracelsus*, a single dose of which, he affirms, was sufficient for the cure of any case of fever. "*Id remedium est sudorificum.* Etiam istud remedium est Præcipitatus Diaphoreticus Paracelsi, qui omnem sanat febrim unica potione.—*De febribus*, cap. XIV.

beneficial when employed before symptoms of prostration and collapse have come on. Under these latter circumstances, blisters are frequently resorted to at too late a stage to be of any service; whereas, had they been employed at an earlier period, the alarming and fatal symptoms might have been prevented. When blisters are resorted to in cases of prostration and collapse, other stimulating means should at the same time be resorted to, as wine sangre or brandy toddy, immersing the feet and hands in hot water, bathing the extremeties with warm spirits of turpentine, the application of sinapisms to the palms of the hands and soles of the feet, &c.

In affections of the head, as pain, delirium, or stupor, the application of blisters to the temples, forehead, or back of the neck frequently affords signal relief.

Blistering is also of service in bringing fever to a crisis after other remedies have failed. Sometimes, notwithstanding, the use of blood-letting, emetics, purgatives, the cold bath, &c. the fever will still continue, seizing upon the brain, producing derangement, coma, and alienation of mind; under these circumstances, the drawing of a few blisters on the back of the neck, extremities, and region of the stomach sometimes operates like a charm in removing the unfavorable symptoms, subduing the fever, restoring the intellect, and removing the anxiety and restlessness of the patient.

This remedy is likewise useful in preventing a return of the paroxysm after a remission. When, from previous alarming symptoms, I have had reason to apprehend the serious consequences of another exacerbation, I have sometimes succeeded in preventing the return of the fever by the application of half a dozen blister plasters to different parts of the body. The places to which I generally apply them, are the inner side of the wrists and ankles, the pit of the stomach, and the back of the neck: calculating the time of the succeeding paroxysm, the blisters should be applied so as to exert the full force of their operation just before the period of the expected chill.

The association which exists between the nervous and vascular systems will probably afford an explanation of the operation of blisters in preventing the return of paroxysms of remitting fevers, in the same way that other stimuli accomplish the same object. The suspension of the operation of the morbid cause occasioned by blisters, though not permanent, affords an opportunity for the more effectual application of other remedies.

Dissections show that the stomach is generally more or less affected in bilious fevers. In every case which has come under my observation, when the body has been opened, traces were observed of considerable preceding inflammation; the veins have appeared distended with dark grumous blood, and the villous lining of a deep red, as if from successful injection. The known efficacy which blisters possess in relieving local inflammations, points them out as valuable remedies in all cases of bilious remitting fever, in which an inflammation of the stomach, as marked by nausea, vomiting, tension, soreness, tenderness, and a burning sensation in this organ, is one of the most troublesome and distressing attendants of this disease. And though the probability is, that in many cases these traces of apparent inflammation proceed from a relaxation of the vessels and a dissolved state of the crasis of the blood, yet we have reason to conclude that on some occasions this organ, as well as others, is affected with actual inflammation in ideopathic fever. There can be as little doubt, that in many cases the brain, cerebellum, and spinal marrow, are also the seat of inflammation in fever. These affections are indicated by the various symptoms which have been previously noticed. And the decided benefit, which on many occasions I have experienced by blistering the back of the head and neck, I am disposed to attribute to the abstraction or removal of inflammation thereby occasioned, from the cerebellum and the cervical portion of the spinal marrow.

When the fever assumes the remitting type, as it generally does, at least during some part of its progress, the Peruvian bark will be found of essential service in cutting short the disease, and preventing the return of the paroxysms, provided the remissions are sufficiently distinct to admit of its exhibition. But little benefit, however, can be expected from the use of this remedy, unless the stomach and bowels have been cleansed by the previous operation of an emetic and cathartic; for when there is an accumulation of morbid bile in the primæ viæ, the exhibition of bark, instead of proving beneficial, will serve only to oppress and sicken the stomach, to render the patient restless and uncomfortable, and to increase and aggravate the fever. There are besides some constitutions with which the bark will not agree in any form; although the person at the time of taking it may have been entirely clear of fever, one or two doses are sufficient to oppress and overload the stomach, to accelerate the pulse, occasion a flushing of the face, and a burning sensation at the epigastrium. Others

again, can take an ounce at a single dose, without experiencing any inconvenience or uneasiness, and with the best effect.

When the remissions are short, the bark should be taken often and in considerable doses. From one to two tea-spoonfuls may be taken every hour or two, or in such quantity as the stomach can bear.

When the bark cannot be taken in substance, it may be given in the form of infusion, and to enable it to sit easier on the stomach, aromatics, as cinnamon, cloves, &c. may be added to it. When it is desirable to keep up the perspiration, as it frequently is, with the view of preventing the return of the fever or chill, snake root (Serp. Virg.) may be usefully added to the infusion of bark. The snake root, moreover, possesses the advantage of covering the disagreeable taste and preventing the nauseating effects of the bark. Should the patient be entirely free from fever, wine may be used with the bark; but otherwise it will be safer and more serviceable to give the cincona without this addition, until a complete solution of the fever is effected: wine and bark will then form a valuable restorative and tonic.

Bark is also serviceable in checking the profuse cold and clammy sweats which sometimes take place in the progress of the fever: and in such cases, the elixir of vitriol may be added with advantage; the latter remedy, indeed, under all circumstances may be usefully given in combination with the bark, as it causes the latter to sit easier on the stomach, and resists what was formerly called the septic or putrid tendency of the disease, but which I have previously taken the liberty to call the alkalescent tendency, or disposition of the fluids.

The circumstances which render the exhibition of the bark proper and necessary are, the declining strength of the patient, the sinking of the pulse, the cold and clammy state of the surface of the body, and the subsidence or evident remission of the fever. To exhibit it under any other condition of the system, it cannot fail to prove injurious; by constricting the surface, shutting up the excretions, increasing the heat and anxiety of the body, and giving rise to congestions of blood in the internal viscera.

Bark is not always, nor perhaps in a majority of cases, admissible in the typhous, or asthenic state of fever. In this state there is not unfrequently a fulness of the pulse and a heat of the skin altogether incompatible with the employment of bark; but when the circulation is languid,

the skin cool, and the patient much debilitated, bark and wine may be given with advantage.

Where the disease, however, has been properly treated, bark and wine, as stimulants, will seldom be required, until a complete remission has been established, unless the fever is of a very malignant character, where typhoid symptoms, accompanied with prostration, are apt to supervene at an earlier or later period of the disease: in such cases bark and wine become necessary. In their employment we should be regulated as to the quantity required by their effects upon the constitution; our object is to keep up a moderate action till the system recovers, in some degree, the proper exercise of its various functions. As life in such cases hangs suspended by a feeble thread we must be cautious in its management; by stimulating too highly we exhaust prematurely the poor remains of vitality, and split upon the fatal rock which we have been endeavoring to avoid.

There are, probably, but few instances in which more than a pint or a bottle of wine will be necessary in the twenty-four hours. In a very few cases I have found it necessary to give, in the course of the day and night a quart, or rather more of Madeira, diminishing the quantity by degrees as the system resumes the exercise of its paralized and suspended functions. Upon this subject no certain rules can be prescribed, as much will depend upon the strength and quality of the wine; the age, sex and constitution of the patient; his former habits with respect to temperance both in eating and drinking; the stage of disease; the degree of torpor and debility; the nature of the epidemic, as being more or less malignant; and the effects of the wine upon the patient.

When the debility and prostration have come on suddenly, wine should be given with more freedom and in greater quantity than when the debility has been gradual in its approach; and it is only in such cases that large quantities of wine are admissible. If the effects of this stimulus are transient, if the pulse is easily and suddenly excited by it, and as suddenly falls again to its former weakness, but little benefit can be expected from it, and by pushing it too far, under such circumstances, we exhaust the vital principle and hasten the death of the patient. If, on the contrary, the immediate excitement is less considerable, but more moderate and permanent, giving tone and stability to the pulse, and imparting strength to the system, we are authorized to continue the employment of the

remedy with the reasonable prospect of advantage. Though even in cases where bark and wine are beneficial we should be cautious in pushing the stimulus too far, otherwise we shall injure rather than benefit the patient.

Though bark and wine are often given together, the circumstances which require their use are not in every instance precisely the same. In all cases of sudden prostration, and in the asthenic stage of the disease, when the pulse is permanently weak, bark and wine may both be used with advantage, provided the stomach is able to retain them, otherwise the wine should be given without the bark. But it often happens in bilious fevers that the remissions, though, as the term implies, not amounting to a complete apyrexia, are yet sufficient to admit of the exhibition of bark alone, or, what in many cases is still better, in combination with snake root, so as to promote perspiration; and which instead of increasing the fever, when the excitement is slight is often found to moderate and subdue it: in such cases wine is inadmissible, and would be found to aggravate the fever.*

Some physicians, and of this number are Mr. Cleghorn and Dr. Jackson, are of opinion that the bark should be given without waiting for the operation of cleansing the first passages; observing that this colluvies of the stomach and bowels is owing to that condition of the system which supports the fever, and that by putting a stop to the latter the morbid condition of the primæ viæ is corrected, and the cause of these impurities removed. This change, says Mr. Cleghorn, is affected by the bark, which by corroborating the solids, enables them to throw off the excrementitious fluids by the proper emunctories.† Mr. Cleghorn thinks moreover, that it may be laid down as a general rule in all cases of fever, to give the bark liberally and without hesitation about the third or fourth period of the disease, whether evacuations have been previously used or not. A similar practice was pursued by Dr. Jackson in the fevers of America: and he informs us that if in the autumnal months symptoms of malignity appeared, he generally seized the first intermission for exhibiting the bark, without the previous exhibition of either an emetic or cathartic,

* The great advantage of wines in fever over spiritous liquors is owing to the circumstance of their containing more or less of an acid and a saccharine matter. All wines give a red colour to paper stained with turnsole. Chaptal has ascertained that the acid found in greatest abundance in wine is the malic, but he found traces also of citric acid, and it is probable that wine is never destitute of tartar. See *Thompson's Chemistry.*

† Diseases of Minorca, p. 130.

though the bowels should be oppressed with colluvies. He gave two drams every two hours, during the absence of the fever. Two ounces, he observes, taken in the course of eight or ten hours, were more effectual than double the quantity in small doses at distant intervals.

This practice may be very well suited to some cases, as I have myself experienced: this, however, can only be ascertained from trial, and where there is no immediate danger to be apprehended, I always premise the use of an emetic or cathartic before giving the bark. Where this practice is omitted, I have remarked that this medicine is apt to sicken and oppress the stomach, and to produce a febrile commotion in the system, which it is sometimes difficult to subdue. Besides, bark sometimes constipates the bowels, and the interposition of purgatives are then indispensably necessary. It may be laid down as a general rule that where the pulse is tense, the bark is inadmissable, more particularly in the early stage of fever. It is true that, on some occasions, where I have been certain that the stomach and bowels have been well cleansed, I have known the pulse, from being somewhat tense and hard, become softer from the exhibition of the bark, and the skin, which was before dry, become moistened with a general perspiration after the first and second dose. But should the bark be exhibited under the circumstances of a tense pulse, though the skin should be cool and no other symptoms of fever be present, yet if at the same time there should exist a foul condition of the stomach and bowels, there will be danger of a fatal congestion, inflammation or gangrene of some of the internal viscera.

Where the debility is great and the symptoms of the previous paroxysm have been alarming, the stomach and bowels remaining uncleansed, I have sometimes prescribed with the best effect the bark in conjunction with rhubarb; say five grains of rhubarb to every tea-spoonful of bark, repeated as often as the stomach will bear; the rhubarb to be continued till the bowels have been sufficiently cleansed; and to be checked in its operation should this prove too severe, by the exhibition of thirty or forty drops of laudanum.

From the presence of inflammatory symptoms bark may be found injurious at the commencement or during the early stage of fever, and yet be given with advantage at a subsequent period, after the inflammatory symptoms have been subdued by proper evacuations, or by the continuance of the fever itself.

When from idiosincracy of constitution the patient is unable to take the bark, when the fever begins to assume the typhoid character, or when the remissions are not sufficient to authorize the use of the bark, vegetable bitters, as quassia, gentian and columbo, with snake root and a portion of some aromatic, as canella alba, cinnamon or cassia may be usefully substituted. They produce less heat and excitement than the bark, and sit more easy on the stomach.

Sometimes, when we are apprehensive of increasing the fever, where this is slight and attended with a dry skin, the infusion of snake root alone may be given with advantage.

It often happens in the remitting bilious fever, that the stomach is too irritable to retain the bark in any form, and yet, from the state of the patient, it is of importance that it should be exhibited, under such circumstances, and when the remissions are short and the debility great, I direct the bark to be given by injection: one or two ounces mixed with a small quantity of warm water, with the addition of eighty or a hundred drops of laudanum, may be exhibited in this way with the greatest advantage: Besides when given in this manner, though it acts less powerfully on the general system than when received into the stomach, we derive this important advantage, that we have it in our power immediately to remove it upon the recurrence of the exacerbation, should this take place; whereas, when taken by the mouth, by remaining in the stomach and bowels upon the rise of the fever, the symptoms are considerably aggravated by it.

The sulphate of quinine, a preparation of bark, has lately been introduced into medical practice. One grain is represented as equal to one dram of the powdered bark. It is given in pill, or suspended in water with a little essence of peppermint or cinnamon. I have never used it sufficiently to speak in positive terms of its efficacy; the extravagant price of the article will, moreover, probably exclude it in a considerable degree, from extensive and general use.

As Champaigne wine, cider, perry and porter all contain a considerable quantity of carbonic acid, where stimulants are indicated they may be advantageously prescribed. As the carbonic acid of these liquors allays the irritability of the stomach, they are particularly adapted to those cases of weakness and inquietude of this organ resulting from attacks of remitting fever.

I have said but little concerning the use of distilled spirits in the treatment of this disease, because they are by no

means equal to fermented liquors, and can seldom be employed for the same purpose, except in cases where the latter cannot be obtained of a good quality, or where they are found to disagree with the stomach.

In sudden emergencies, where the patient becomes in a short time alarmingly prostrated, with sinking of the pulse and a coldness of the surface and extremities, as not unfrequently takes place towards the termination of the paroxysm, or from the severe operation of an emetic or cathartic, where the cause is powerful, the constitution delicate, or the reaction weak: under such circumstances we are called upon to use every exertion to arouse and restore the sinking energies of nature. In this we may sometimes fail, more especially in cases which have been of considerable continuance, the constitution delicate and weak, and when the sinking has come on as the result and progress of the fever and not from any sudden evacuation. We should never, however, in such cases abandon our patients in despair; provided the intellect is clear, the brain free from lethargy or coma, there is still considerable hope of a recovery, more especially if the patient is composed and free from anxiety and pain. I have seen and treated patients whose extremeties were cold as marble, and in whom no pulse was perceptible at the wrist, who gradually emerged from this prostration, after remaining in this state of torpor and death-like coldness for five or six hours. In such cases stimulants internally and externally should be employed; we should exhibit every few minutes a table spoonful or two of hot brandy toddy tolerably strong, or wine sangre; hot and stimulating applications should be made to the extremities, as bathing the arms, feet and legs with hot brandy or spirits of turpentine, applying to the inside of the arms and legs stimulating cataplasms of cantharides, mustard and spirits of turpentine; immercing the feet and hands in hot water, and subsequently keeping them warm with heated bricks or irons, or boilded blocks of wood. These means should be persisted in until the natural warmth returns and the pulse is restored to some degree of vigor: the stimulus should then be gradually diminished and withdrawn.

Both the vegitable and the mineral acids have been employed in fever with universal confirmation of their utility. The vegitable acids as the juices of limes, lemons and other acid fruits, as being more grateful, may be substituted for the mineral, and used, probably, with equal advantage. The mineral, as possessing more of the tonic property, are

better suited to the advanced stage of the disorder. They are all highly serviceable and refreshing in fevers of a bilious and malignant character. They correct the morbid secretions of the abdominal viscera; and serve to act on the *materies morbi* of the primæ viæ, in the same way as the fumes of the mineral acids neutralise and destroy infection externally, whenever they come in contact with it.

The laws of contagion, observable in diseases which unequivocally own their subjection, establish the fact that the morbific matter from which they originate, and to which they owe their immediate existence, remains unchanged in the system, possessing there an assimilating power, by which it converts a portion of the fluids to its own nature, and which, in its turn, is also capable of propogating the same disease. If this be the case in diseases of an acknowledged contagious character, as the small-pox, lues, &c. are we not authorized to conclude that the same thing takes place in all diseases arising from infection, whether it is the infection of putrefactive miasms, or of the ship, jail, or hospital fever? We have previously noticed the efficacy of acid fumigations in destroying the noxious and morbid miasms of infected places; we have also noticed the circumstance of various substances being received into the body, and passing through the circulation unchanged, and again manifesting their peculiar properties and odours in the various excretions: from which it appears that there are various substances received into the body totally unfit for the purposes of nutrition, or for supporting the healthy functions of the animal econmy, and which are either eliminated unchanged, or, being retained, become the pabulum and occasion of derangement and disease to the general system. From these considerations we are furnished with a clue to guide us in our researches into the intimate nature of endemic fevers; and the obvious conclusion that forces itself upon our understanding is, that the essential causes of these diseases are received unchanged into the mass of the circulating fluids, which, after having become assimilated in a certain degree to the peculiar nature of the morbid poison, produce derangement in the vascular and nervous systems; and exciting the heart and arteries to unnatural and morbid action, give rise to the various symptoms and phenomena of fever. The practical purposes to which this knowledge may be applied is of the first importance in the treatment of fever arising from putrefactive and infectious miasms, such as the endemics of the southern states, and of all hot and tropical climates.

It is in this way that we would explain the benefit derived from the use of acids in the treatment of fever. It is upon the same principle that acids and acescents prove so efficacious in scurvy and scorbutic disorders, between which and typhus, under its various malignant aspects and denominations, we have already pointed out the analogy and relation. The causes of fever are less obvious than those of scurvy; the latter disease evidently arises from the excessive or disproportionate and almost exclusive use of animal food; fever of the endemic kind arises from volatile and gaseous matters, the result of animal and vegetable decomposition, floating in the asmosphere, and from it received into the mass of circulating fluids; in which they produce a contamination similar to that which exists in the fluids of scorbutic patients.

It may be asked, if such is the similarity in the essential causes of fever and scurvy, why do we not observe the same vascular excitement in the latter as in the former disease? To this, I would answer, that the matter of scurvy is probably not so active, poisonous and stimulating as that of fever; though in this, there is some variation, and we read in various authors of epidemic scurvies having made their appearance in besieged towns, camps and armies, which from their malignancy and mortality, have been mistaken for the plague itself. In another work,* I have given an account of the pestilential scurvy of Terreaux Beuffs, which committed such ravages in the American army, and which equalled in fatality, the plague of European writers. May not an inferior as well as an excessive influence of the same cause operate as a sedative, which when in neither extreme acts as a stimulant? Is not this exemplified at the commencement and termination of cases of endemic fever? Languor, lassitude and various signs of debility, with a frequent, weak and small pulse, are the premonitory symptoms of most fevers, and which frequently continue for three or four days before the full marked character of fever is completely disclosed. This first stage of fever corresponds with the condition of the system in scurvy, in which a slow poison, operating on the heart and blood-vessels, weakens their energy of action, and relaxes the substance and impairs the strength of the muscular fibre.

Could acids, taken internally in fever, come immediately in contact with the morbific matter, we have reason to

* Topography and Diseases of Louisiana.

conclude that they would instantly destroy it, and cure the disease by neutralising the virus. But it is well known that the stomach has considerable power in changing the substances taken into it, so that it is only when the system becomes over charged with particular substances, that they manifest and exert their influence upon the general habit; and as the matter of fever is diffused and intimately blended with every portion of the animal body, its antidote must be co-extensive in diffusion, in order to neutralise and destroy its morbific property. But as fever is frequently a disease of such rapid progress and speedy termination as to produce an irreparable lesion of the constition before the system can be sufficiently impregnated with the antidote to bring about a solution of the disorder, a leading object and indication in its treatment will be to palliate the most urgent symptoms, by the use of the remedies before pointed out, until the expulsion and correction of the morbific matter shall be effected by nature and art.

Were fever a disease equally slow and lingering in its progress as scurvy, we have reason to think that acids and acescents would be found equally effectual in its cure.—Health is not immediately restored to scorbutic patients by a change of diet and vegetable acids; to renew and restore the healthy condition of the animal fluids is the work of time, proportionate in its duration to the inveteracy or mildness of the disorder, and to the quantity and regularity in which the specific correctors of the scorbutic condition of the fluids are taken.

Yet, notwithstanding, the various difficulties that oppose themselves in the treatment of fever, in every point of view acids will still be found extremely beneficial. They moderate the excitement, promote the secretions of perspiration and urine, and operate as laxatives upon the bowels. The ancient physicians are extravagant in their praise of these remedies; to which they considered them entitled as well from theory as experience of their benefit. Their doctrine in malignant fever was, that of putridity, and of course, the obvious indication was the exhibition of antidotes to this putridity. These remedies they called antiseptics, and exhibited them with a liberality proportionate to the septic or putrefactive tendency which they believed to exist. Such, however, was the imperfection and obscurity of medical science, that the practice was founded on no fixed or rational principles, and although general experience might establish the utility of certain articles; yet, on various occasions we find them indulging in a vein of

absurd speculation, and giving advice about the acids and alkalis, salts, slime, acrimonious, &c. as indespensibly necessary to be discriminated in the treatment of fevers; one kind of salt requiring one thing, and a different one another. If the fever proceeded from *viscid humours*, diluting drinks were the specific antidotes. And much profound reasoning and acute argument were introduced into their discourses to prove the truth of their doctrine. "The high colour of the urine in fever," says Etmuller, "must need proceed from a prutrescent acid, for alkalies give a contrary tincture. Immoderate use of wine produces the same symptoms as fever, by means of its acid tartarous parts." In another place he remarks, "the slow fevers differ from the acute ones in this; that the cause of the latter is a volatile sharp acid, which in the former is enveloped in a viscid vehicle." Burserius speaking of the acrimonies in fever, says, "according to the different nature of each, peculiar medicines must be employed to oppose the particular kind of acrimony and lentor. In general the most proper are diluent watery drinks, gently resolving, attenuent, opening, but of the milder kind; with which it is proper to mix acids, both vegetable and mineral, especially if heat is to be moderated, or a tendency to putrefaction prevented. For it appears that they are both wonderfully refrigerent and antiseptic, whether they produce this effect by blunting the sensibility of the nerves, and checking the sensibility of the fibres; or by changing and saturating the volatile alkaline salts; or by attracting and uniting with the inflammable principle, or in other words, the plogistion; or by condensing the fibres and humours, or in all these ways, is of no great consequence."*

Oxymel was a common prescription with Hippocrates.

The benefit derived from the use of the juices of fruits is owing to the acid which enters into their composition; for it appears that all those juices of fruits which undergo the vinous fermentation, either with or without the addition of sugar, contain an acid.†

Avicenna speaks of the benefit derived from the use of pomegranates and ripe plumbs, and particularly recommends the watermelon.‡

Galen also recommends in fever, such fruits as are of easy digestion.‖ He also informs us in another place that

* Institutes of the Practice of Medicine, by John Baptist Burserius, Vol. I. p. 163.

† Thompson's Chemistry.

‡ Opera Venet. de Feb. C. xxxviii.

‖ De Glauc. l. i. C. ix.

those who are set to watch the vineyards, and live for two months on grapes and figs become fat and hearty.*

Alexander Tralianus extols with admiration the cures he had performed in fevers with ripe fruits, such as peaches, grapes and water-mellons, and which he found of the greatest efficacy in promoting perspiration, and effecting a discharge of acrimonious bile from the bowels.†

Ripe fruits were a favorite remedy with Aretus. Among the advocates of the same treatment we may mention Riverius, Forestus, Fracastorius, Mercatus, Zacutus, Mindererus, and Lucitanus.

As long ago as the tenth century acids were prescribed by Rhazes to prevent the plague.

Vinegar has been long celebrated as a remedy in fevers, both externally and internally employed, and considered as a powerful opposer of contagion.

Diemerbroeck recommends a few tea-spoonfuls of vinegar to be taken in the morning, fasting; and Sylvius says he prescribed it with advantage. His prescription employed for external use received the denomination of *the three thieve vinegar.*

The ancients considered the internal use of vegetable acids not only as a valuable remedy in fevers, but also as a wholesome beverage in health, and a preventive of malignant diseases. Thus the Roman soldiers were furnished with a daily allowance of vinegar, which was mixed with water for a common drink; sometimes thin acid wine was allowed instead of vinegar. The moderns, however, in this, as in many other particulars, have refined upon the ancients, and in place of this wholesome beverage, have substituted whiskey and other preparations of ardent spirits, which so far from acting as preservatives, may be considered the bane and corruptors of temperance, morality and health.

It is observed by Hoffman that of all the remedies that have been employed in the plague, none have been found more useful than acids.

It is said of Boerhaave that in some cases of putrid fevers, he successfully ordered ten pounds of cherries daily. And his commentator, Van Sweeten,‡ says, "the juice of ripe fruits requires no preparation, extinguishes thirst, tempers heat, opens the belly and urinary passages, and furnishes the most exquisite solace to the stomach oppressed with putrid bile."

* De Alim. Facult. l. ii, et ix. † Lib. xii, c. vi

‡ Van Sweeten Sec. 83. li. p. 126.

"The juices of citron and sorrel," says Senertus, "resist putrefaction, peculiarly strengthen the heart, correct the feverish habit, and have apperient powers at the same time."*

We are informed by Mr. Cleghorn that the persons appointed to watch the vineyards in the island of Minorca, from eating the ripe fruit, commonly continue in good health, though at the same time tertians generally rage with the greatest violence.

In the treatment of bilious fever, Dr. Tissot informs us that after the first evacuation he seldom prescribed any thing except strong lemonade, or a decoction of the roots of quick grass, with an addition of the expressed juice of common sorrel.†

Dr. Fordyce, in his work on putrid and inflammatory fever, praises in high terms the benefit derived from the juices of ripe fruits, and says that they are the best provision in putrid fevers, and that in the bilious dysentery they act like a charm. "Such (says he) are the virtues of the vegetable acids; and when physicians discover by an early attention to the smell of the sweat, the urine or fœces, or a close examination of the colour of the skin, tongue, &c. a tendency to a putrid state, they cannot only cure many dangerous, but prevent many fatal diseases by such means. Decoctions or infusions of frumentacious substances, seasoned with sea-salt, cream of tartar drink, thin wine, juice of lemons, and plain vinegar, do all contribute largely to an immediate, and perhaps a lasting change of the corrupted juices. When the disease is not contagious nor the putrefaction extreme, the vegetable acids are generally sufficient; and when no inconvenience is found from their use they may be given freely. It is a mistaken notion that they will produce the colic, or disagree when there already subsists one, as in putrid cases of colic we know that nothing proves a speedier cure. In a very putrid state of the juices the mineral acids are used with the greatest advantage. The muriatic has, with me, the preference, from the observations I have made of its effects. Applied to the fauces in the ulcerated and malignant sore throat, they prevent the putrefaction, and preserve the part from gangrene, or even stop its progress when already begun; taken into the stomach, they excite appetite by correcting its juices; for nothing palls it more than putrid matter lodged there. It is a fact well known, that they are very useful in dysentery; I mean the bilious

* Senert. de Feb. Lib. ii. cap. vii. p. 221.

† History of the Bilious Epidemic Fever at Lausane in 1755.

one so common in armies during the autumnal season, when they correct the corrupted fevers, and act as strong antisceptics, hindering the putrid process in the animal economy. Finally, the best writers and the most scientific practitioners are agreed about their great use in putrid fevers.*

Ripe fruits, and particularly grapes, are recommended by Dr. Stock in the bilious fluxes of armies, and he considers the mineral acids mixed with opiates as possessing wonderful efficacy in that disease.†

It is observed by Assalini, that some soldiers, on their return from Gaza, with a convoy, discovered at a distance a French soldier wandering amongst the sands, about two leagues from the fort; they went up to him, and found him with a bundle of sorrel under his arm: the man had been attacked with the epidemic disease, called the plague, and during his delirium had run off from the hospital. During the fifteen days which followed he had taken no other nourishment than sorrel, and he recovered perfectly.‡

In typhus, Dr. Trotter recommends fruits, such as oranges, gooseberries, currents, raspberries, prunes, melons, &c. and remarkes that if they do not disorder the bowels, which they are apt to render too lax, they may be used *ad libitum*.§

Dr. James Carmichael Smyth praises the efficacy of acids, particularly those of the mineral kingdom, exhibited both in the early and latter stages of malignant fevers, and considers them more remarkably serviceable in checking the tendency to extravasation and hæmorrhage. "In the last stage of those fevers," says he, "joined with the bark, they seem to increase the power of the medicine in resisting the disposition to gangrene."

Dr. Monro‖ recommends ripe fruits in typhus fever, for the purpose, as he says, of correcting the tendency of the blood to putrefaction, being both grateful and refreshing to the sick; and ought therefore, to make a part of their allowance. "I have seen," says he, "lemon juice made palatable by the addition of sugar, prove a most cordial antisceptic in this fever, either given in draughts of one, two, or more ounces, five or six times in the day, or mixed with the patient's common drink."

The yellow fever prevailed at Caraccas, in South America, in October 1793, with great mortality, more especially

* Fordyce on Putrid and Inflam. Fev. p. 158 and Seq.
† Ann. Med.
‡ Assalini on the Epidemic of Egypt, p. 67.
§ Med. Naut. Vol. I. p. 277.
‖ Diseases of the Army, p. 247.

among the Spanish troops. Nearly all died who were treated by the physicians. Recourse was finally had to the old women, who were successful in almost every case to which they were called. Their remedies were a liquor called *narancado*, (a species of lemonade,) and a tea made of a root called fistula. With these drinks they drenched their patients for the first two or three days. They induced plentiful sweats.*

Nature, indeed, points out the utility of acids in fever, by the instinctive cravings of the patient; and whilst animal food, one of the most pernicious articles in this disease, proves disagreeable and loathsome, all acids are found the most grateful and refreshing.

It sometimes unfortunately happens, that from inflammation or irritability of the stomach, the mineral acids, even when plentifully diluted, cannot be taken without producing pain and exciting vomiting. In such cases we must refrain from their employment; the same objection, however, rarely applies to the acids of the vegetable kingdom.

Mindererus spirit, supersaturated with lime juice or vinegar, with the addition of a small portion of laudanum, proves peculiarly efficacious as a diaphoretic, corrects and neutralises the bilious accumulations in the stomach and bowels, and promotes their expulsion.

The vulgar and prevalent opinion with regard to fruits in the supposed tendency which they produce in the system to fevers and dysentery is entirely without foundation. These remedies are pointed out by nature, and instinct teaches us to make use of them. Though they may excite the alvine evacuations, yet this is so far from proving injurious, that it is one of their most valuable properties. For by correcting and decomposing the bile they counteract and destroy its morbific quality; and by forming a kind of neutral mixture they act as mild cathartics, and promote the expulsion of offending matters. Every person who has had experience in the fevers of hot and tropical climates must be convinced of the necessity of keeping the bowels regular and free during the summer and autumn; and if this can be done without the aid of medicine we gain an advantage of the first importance. And what means so simple can more effectually answer the purposes and suit the necessities of the animal economy, during this insalubrious season, than the use of the same provision and antidotes to disease which nature affords us in the vegetable

* Rush's Inq. and Obs. Vol. III. p. 315.

kingdom? And how worthy of condemnation is that absurd and unnatural opinion, which, with ill-judged kindness, would prohibit the very remedies which Providence has furnished for our health and comfort? Wherein do we most discover the wisdom and benevolence of superintending goodness? Is it in presuming the prohibition of the enjoyment of that plenty which his own bounty has provided, and in supposing that the fruits that load the branches and the vine are but tantalizing temptations, pleasant to the eye, sweet to the taste but poisonous in their enjoyment? Or is it in following the precepts of experience, and receiving as blessings in their season the fruits and productions of the vegetable world? A restriction, the breach of which expelled our father Adam from the bowers of Eden, is not now entailed upon his children. The orange and the apple are no longer presented to the view as prohibited enjoyments, to tempt the eye and disappoint desire, but for our use and welfare are they new-relished and matured.

The great utility of acids in the cure of fevers remains yet to be more generally known and understood by their more extensive and liberal employment, not as palliatives merely, but as the chief and essential remedy in the cure of fever. Taken, as they usually are, merely to render the patient's drink more agreeable, but little benefit can be expected from them. But let them be exhibited as remedies capable of purifying the contaminated fluids of the body, in quantity proportionate to the malignancy of the disorder, and an improvement in the treatment of fever will take place as great as that which succeeded to the hot and sweating regimen in the treatment of small-pox. This is not a matter of mere speculation, a doctrine advanced solely with a view of supporting a favorite opinion. I appeal to experience, by which the utility and importance of these remedies in the treatment of fever is fully confirmed, even when given with a sparing hand, and without any particular object in their exhibition, except that of allaying the thirst and gratifying the taste of the patient.

The natives of many eastern countries cure their patients laboring under fever, by the liberal, and what we should call the excessive use of lime-juice alone.

Some few years since the attention of the faculty of Europe was drawn to the more attentive consideration of this subject from the extraordinary success of Professor Reich, of Erlangen, in the treatment of fever with the mineral acids. Sale, Fretze, Richter and Fourny were appointed

a committee, under whose inspection Dr. Reich administered his remedies to twenty-eight patients in the Charite; of these, twenty-three recovered, three refused to take the medicine and two died. For making known this valuable remedy a very considerable pension was granted to Professor Reich by the King of Prussia. Dr. Reich informs us that in cases of extreme danger and malignancy one or two drachms of the muriatic acid may be given at once. The oxygenated muriatic acid may be employed with the same view. "I, at first," says the Professor, "for a long time made use of the sulphuric acid, but finding that it was not relished by the sick, that it did not part with its oxygen quick enough, and that it often felt heavy in the stomach, I made trial of the common muriatic acid, and this proved in the result, to be one of the best and most pleasant acids. I have, since that, constantly made use of it. Besides these two mentioned acids, I have made use of others, and found their operation coincide with my opinion." Dr. Reich thinks well of the phosphoric acid, but is apprehensive of the hurtful effects of the nitric in some of its forms.

Why so valuable an improvement has been so much neglected, we can only account for by ascribing it to that pride of individual opinion, which looks with jealousy and distrust upon the superior claims, pretensions and discoveries of others, and to that prejudice in favor of received and antiquated dogmas, which would rather cherish an antedeluvian error than embrace a modern truth. The nitric and muriatic acids were employed with decided benefit, especially in cases marked with malignant or typhoid symptoms in the endemic fever of Alabama in 1821—22 and 23, they were also given as tonics in the advanced stage of the disease, and during the period of convalescence.*

The vitriolic, or sulphuric acid was long since known as a useful remedy, and is highly recommended by Riverius and Sydenham for allaying febrile heat and thirst, abating inflammation, resisting putrefaction, and checking hæmorrhage; and we are told by Sydenham that he chiefly depended upon this medicine for moderating the eruptive fever in the confluent small-pox. It is well known that the mineral acids, and particularly the nitric has been used with the most signal success in the cure of syphilis, even in those

*The reader will find an interesting case of the successful employment of nitric acid in bilious fever, related by Dr. Isaac Auld, of South Carolina, in the 3d vol. of Dr. Cox's Philadelphia Medical Museum.

cases where mercury had failed. We know not by what peculiarity morbid poisons differ from each other, so as to vary their effects in the developement of their individual and specific symptoms. But however diversified in appearances the presumption is, that the morbid poisons of all malignant diseases are analagous in their chemical and constituent principles. Thus the various forms of the exanthemata, as the small pox, chicken pox, French pox, &c. all summer and autumnal fevers, arising from putrefaction, the different denominations of typhus, ship, jail and hospital fevers, in fine all fevers, except the simple continued or inflammatory fever, arising from suppressed perspiration, probably originate from modifications of the same cause, and require a similarity of practice in their prevention and cure.

Dr. Ferrier of Manchester has found the nitrous acid very useful in the latter stages of typhus, when the Peruvian bark disagrees, or when the patient will not take bark or wine. He gives one and an half drachm three times a day.*

Mr. Snipe, Surgeon of the *Sandwich*, ascribes the success, in subduing a contagious fever, which raged on board that ship, to "cleanliness, free ventilation, and the diffusion daily of nitrous acid gas through every part of the ship."†

Mr. Farquhar, of the Theseus, found the nitrous acid vapour to destroy the smell proceeding from putrid ulcers.‡

In the treatment of fever I have found the carbonic acid gas of the greatest benefit. It subdues the vomiting, allays the irritability of the stomach, and enables it to retain the necessary remedies received. But as it is difficult to exhibit this article by itself, the mixture of a vegetable acid and an alkali, as the carbonate of soda or potash with lime juice or good strong vinegar, affords an excellent prescription. From ten to twenty grains of the carbonate of soda or potash may be mixed with nearly half a wine glass of lime-juice, the soda being seperately dissolved in a little water, and the lime-juice rendered more agreeable by the addition of refined sugar, and then being suddenly poured together they should be taken in the act of effervescence. The soda or seidlitz powders of the shops as they came prepared, are, perhaps, as good preparations of the kind as can be employed. I have generally prescribed them, and have found them very beneficial. To avoid oppressing the stomach, the papers should be divided into two or three portions, and mixed and taken as the carbonate of soda

* Dunc. Ann. of Med. Vol. IV. p. 46.
† Smyth on Nitrous Vapour, p. 202.
‡ Smyth on the Fall Distemper, p. 212.

and lime-juice. This prescription is calculated to answer several useful purposes: the carbonic acid, thus received, is grateful and cooling to the stomach, and is a corrector of the vitiated fluids of the primæ viæ; whilst the neutral salt, formed by the combination of the acid and the alkali, acts as a diuretic and diaphoretic, and keeps up the action of the bowels.

The saponaceous and alkaline quality of the bile has been already noticed, as likewise the redundancy of this fluid in endemic fever, and from the chemical action of acids in decomposing the bile, as already observed, their great utility in this respect alone, in the fevers of hot and tropical climates, must be sufficiently manifest. I have found whenever there was a great redundancy of bile, as indicated by a jaundice color of the skin and eyes, thick and yellow urine, tinged and abounding with bilious matter, muriatic acid was exhibited with the best effect. By neutralizing and destroying the bile, and also by correcting that state of the fluids disposing to its redundant secretion, it restored the healthy color of the urine, removed the yellowness from the skin, and subdued the lurking fever.

For allaying the irritability of the stomach the application of a blistering plaister to the epigastrium, as before directed, will often be found of considerable advantage. At other times hot fomentations with water and spirits, impregnated with camphor and opium may be applied to the region of this organ. I have also found considerable relief from a mixture of elixor vitriol, with the oil of cinnamon and spirits of peppermint; and on some occasions I have known a dose of calomel with a grain of opium give an immediate check to the vomiting and irritation. Should these fail, a small injection of warm water with eighty or a hundred drops of laudanum may be given with a prospect of success. Equal parts of lime-water and milk have sometimes been given with the best effects in restraining the vomiting and allaying the irritability of the stomach. Milk alone, has often been successfully exhibited in violent attacks of the cholera-morbus. For the purpose of allaying the vomiting, Dr. Rush prescribed in the yellow-fever of Philadelphia, a table-spoonfull of sweet milk every hour, or small draughts of milk and water; which he represents as superior to any other remedy.* For the same purpose Dr. Blane recommends magnesia and mint water.† For the

* Rush's Inq. and Obs. Vol. III. p. 287.
† Diseases of Seamen, p. 452.

distressing vomiting occuring in the second stage of fever, Dr. Physic, Dr. Church and others gave, in the yellow fever of Philadelphia in 1805, the spirits of turpentine with great success, in the quantity of ten drops in a little molasses, syrup, or sweet oil, every two hours.*

For restraining hiccup the nitric acid diluted, a draught of wine, or cold water, raising the patient to an erect position for a few moments, will all occasionally afford a temporary relief.

In persons of slender and delicate constitutions, a cough sometimes continues or supervenes after the disappearance of the fever. As this symptom proceeds mostly from debility and irritation, without any inflammation or settled organic disease, tonics, as vegetable bitters and wine will be found its best remedies. And it is a remark made by the sagacious Sydenham, that the best remedy for a cough, after a fever, is rich nourishing wine. When the cough is more inveterate I have prescribed tar-water and syrup of hoar-hound with the best effect. The tar-water is directed to be taken as a constant drink.

Many physicians in the treatment of fever, are in the habit of using considerable quantities of opium. From my own experience, I am induced to think that their representations of its utility are much exagerated. When fever is present I have always found it injurious when given alone, by agravating the symptoms; if on other occasions it procures sleep, this is disturbed and unrefreshing, the patient's mind is stupified, deranged and bewildered; frightful dreams and incubus terrify his slumbers, and he recovers from the stupifying effects of this narcotic, languid, sick, and feverish. If given in the absence of the fever, it is still exceptionable; and one hour of natural sleep is more refreshing and serviceable to the patient than half a dozen of forced slumber, obtained by the use of opium. Independent of its debilitating effects, a very material objection to this drug is that it corstipates the bowels. I speak here of the employment of opium as an anodyne, without being combined with other articles to obviate its injurious effects. When given in small quantities and in combination with other medicines, as in the preparation of Dover's powders, or with calomel, antimonial powder and nitre, it aids the operation of the compound, and may some times prove serviceable as an anodyne and diaphoretic. But as the powers of opium alone as a diaphoretic are limited and uncertain, it should

* Diseases of seamen p. 452.

never be given when the fever is present, except in combination with other articles, as in the above prescriptions. Where the patient is free from fever, but languid and debilitated, and wherever stimulants are required wine will be found the best anodyne.

The principle view with which opium can be given in fever with advantage is to prevent the return of expected paroxysms. With this intention I have frequently prescribed it in fevers both of the intermitting and remitting type, when unattended with symptoms of malignity, in the manner pointed out when treating of the cure of intermitting fever. Where much nervous irritation prevails, with little or no fever, and the patient is exhausted for want of sleep, a dose of opium may be given with advantage.

Where the remitting assumes, as it often does the intermitting form, it of course should be treated in the mode required by the latter; and *vice versa*, when ague and fever changes to the remitting fever a corresponding change will be required in the treatment.

In managing the regimen of febrile patients cleanliness and ventilation are highly necessary to be observed. The patient's bed and body linen should be frequently changed; clothing that has been much wet by perspiration should be removed at least once in twenty-four hours. The room should be kept free and clean from all excrementitious matters voided by the patient. The apartment should be kept as clean as possible; the walls should be divested of old clothes and garments, and all unnecessary furniture should be removed from the patient's chamber. During the day the windows and doors should be kept open, in such a way as to exclude the sun and admit the air. The apartment should be frequently sprinkled with vinegar, or fumigated with vinegar poured upon a hot brick or shovel, which purifies and refreshes the air, and has the effect in some degree of correcting and destroying infection.

If, upon the invasion of the fever the patient could be conveniently removed in a litter, or some easy mode of conveyance to an airy and healthy place, within a short distance, his cure would be much facilitated. The advantage of wholesome air is of immense benefit in facilitating the recovery of a febrile patient. In illustration of this subject I will subjoin the following facts. The first is from a correspondent of Dr. Lind's who had resided a long time in the Island of Jamaica. "I have often seen," says he, "the poor seamen in the merchant service to recover from the yellow fever solely by having the benefit of a free and con-

stant admission of the cool sea air, into a ship anchored at a distance from the shore, where they lay utterly destitute of every assistance in sickness, and even of common necessaries, having nothing but cold water to drink, and not so much as a bed to lie upon: while gentlemen newly arrived from England, by being shut up in small, close, suffocating chambers at Kingston and Port Royal, expired with the whole mass of blood dissolved, flowing from every pore; the stifling heat of their room having produced a state of universal putrefaction in the body, even before death."*

Palloni, in his Essay on the Yellow Fever of Leghorn in 1804, speaking of the advantage of pure air in the prevention and cure of this disease, makes the following observations. "Those who remove from the country where it prevails, if they were not sick at the time of their departure, the seeds of disease are not generally unfolded, as they seem in such cases to be corrected or destroyed by the change of air and situation. But there can be no stronger or more cogent argument in favor of the usefulness of pure fresh and renewed air in this disease, than the happy experience of its efficacy in the new hospital of St. James. Situated, as it were on the margin of the sea, remote from the unwholesome vapors of the tower, and exposed to the free access of the purest air, which, by reason of its construction and disposition, can act upon it to the utmost advantage; it is well worthy of remark, that it was scarcely open for the reception of the sick, than from that moment the violence of the disease began to abate in the city, and a great proportion of the destined victims were snatched from death. It was wonderful to behold the wretched sufferers taken from their houses, debilitated, oppressed and as it were overcome with illness, who were no sooner lodged in the new assylum, than the vital principle appeared to be renewed in an instant; they revived; they declared that a sensation of well being succeeded to anguish and depression, and the distemper immediately assuming a milder form, yielded to art, and a suitable plan of treatment was at once adopted. In a short time the sick recovered from a short and easy convalescence."

* Lind on the Diseases incidental to Europeans in hot climates.

CONVALESCENCE.

In the northern states and in heatthy countries, the system soon resumes its former strength after an attack of sickness. The unassisted powers of nature and a salubrious atmosphere speedily restore the lost vogor of the constitution, without the aid of medical prescription. Not so in unhealthy climates and situations. The frame is here left weak and languid from disease, and upon emerging from the confinement of a sick bed, the invalid is again exposed to the operation of the same morbific causes which occasioned his previous disorder. Every breath he draws is impregnated with the principles of disease, and a sultry climate still continues to relax and enervate the frame. Under these circumstances, therefore, it is not surprising that persons are subject to repeated attacks of fever during the same season. Indeed, it rarely happens that a person who has been seriously ill recovers even a comfortable share of health, till the ensuing winter; and frequently he is subject to renewed attacks of intermitting fever, or as it is called *chills and fevers* till the return of the succeeding season.

In guarding against these relapses, much will depend upon the habits of temperance and regularity in the person; avoiding late hours, exposure to the sun, rain and night air; observing temperance in eating, always stopping short of satiating the cravings of appetite; refraining from animal food, except in very small quantities, and using it only once a day; selecting vegetables of easy digestion; eating light and abstemious suppers. In addition to all which, the use of the cold bath will be found highly invigorating; to persons, however, of very delicate constitutions it would be inadmissible.

As the body, in consequence of previous disease, is left in a relaxed and debilitated state, persons upon recovering from fever are apt to be attacked with profuse sweats, particularly in the night, during the repose and sleep of the body. Such colliquative sweats are debilitating and exhausting to the enfeebled constitution. The most useful remedies for this complaint will be found in bark, wine, elixir of vitriol and the cold bath.

Under all circumstances of debility, the use of Peruvian bark, two or three times a day, will be found useful; and when the body is much enfeebled, and subject to returns of fever in the evening, bark and wine will be found of the

most essential benefit. In place of the bark, vegetable bitters, as quassia, gentian, columbo and snake root in decoction, with the addition of a moderate quantity of wine, may be used with advantage when the returns of fever do not require the continued use of the bark. Where the bark cannot be taken in substance it may be used in decoction or infusion with cinnamon, cloves, or any other aromatic that may be most agreeable to the patient.

Keeping the bowels free and regular is also of great importance in convalescence from fever, and if the person is disposed to constipation, the best effects will be derived from the tincture of aloes and rhubarb; or a portion of rhubarb, sufficient for the purpose, may be added to the bitters above directed. Persons subject to constipation may also chew a piece of rhubarb root at night before going to bed, so as to operate on the following morning.*

By observing the forgoing directions most of the accidents and returns of disease to which convalescents are liable would be prevented. But many persons in recovering from fever are deaf to the voice of instruction and advice. With keen and morbid hunger, created by the emaciation of the body and the empty state of the vascular system, they sit down to the table, and fill themselves with an excessive and uncomfortable load of whatever is most agreeable to the cravings of a voracious appetite. The consequence is that the stomach is unable to digest the crude and heterogeneous mass, which undergoes a partial fermentation; the stomach and bowels become inflated and distended with air; irritation is produced; and fever is excited. It is vain to suppose that the body will be strengthened by the indulgence of the appetite and by overfeeding; the food, to prove nutritious must be well digested, and it is impossible that this can take place where the quantity of aliment received is too great, and disproportionate to the powers of the digestive organs. Where the stomach is weak the quantity of food should be small and of easy digestion. Hot drinks,

*The following formula will be found beneficial, both as a preventive of fever and a tonic aperient for invalids and convalescents:

Take Aloes two drams, Rhubarb two ounces,
Chamomile flowers, Canella Alba one ounce,
Gentian, Spirits two quarts.
Orange peel, each one ounce.

After standing four days it is fit for use. From half an ounce to an ounce of the tincture may be taken diluted with water, every morning, or as much oftener as the state of the bowels require. It is of importance that the person should have one or two free evacuations every twenty-four hours.

and all fat and greasy articles of diet should be carefully avoided. Nourishment may be taken often, but in a small quantity at a time.

When the patient is labouring under a fever we need have but little solicitude about his eating; for in this situation all nourishment received will but oppress the stomach, and afford support and fuel to the fever. But after the fever has come to a crisis, and convalescence is established, the body is in need of nourishment, which, however, must be taken in moderation, and should not be of a heating and stimulating kind. The teeth are the servants of the stomach, it is by them that the aliments are fitted, by comminution and being blended with the saliva, to undergo digestion; invalids, therefore, cannot be too careful in the deliberate and perfect mastication of their food. Parents and friends are apt to think that provided a person can eat there is no danger: and as eating is necessary to preserve the strength of those in health, the same rule is applied to sickness and indisposition, without any allowance being made for the change which has taken place in the system. Such notions, as they are founded in ignorance and error, so are they dangerous and hurtful in their tendency. The stomach, generally speaking, is the monitor and judge of its own necessities; I say generally; for where persons, especially those of delicate habits have undergone much fatigue, from any sudden, violent, or long continued exertion, the stomach partakes of the temporary exhaustion, and loss of appetite is the consequence: here a little nourishment is not only admissible but useful; and a biscuit with a glass of wine and water will be found refreshing. But in that state of predisposition to fever, created by languor, fatigue and listlessness, a feverish habit, head ache and want of appetite, food is not only loathsome but injurious. It is in vain for the person to think of overcoming his feelings of indisposition and debility by forcing his stomach to receive the necessary sustenance of health. The digestive organs have lost their power, the gastic fluid, the main agent in digestion is changed from its healthy state; and what is eaten under these circumstances is no longer nutritious, but lies with a heavy and oppressive weight upon the stomach, increasing the general uneasiness, and kindling the latent embers of disease. The danger in patients laboring under fever is not in eating enough, but in eating too much. Diluents, however, such as cooling acidulated drinks may be taken freely; the pulp of ripe and mellow fruits may likewise be eaten; and as a nourishment for convalescents and

for patients during the recess of the fever, gruel, and vegetables of easy digestion may be used. But the invalid should avoid salted meats, and touch very lightly upon animal food of any description.* Cucumbers, musk mellons, and all unripe fruits, as being heavy and difficult of digestion should be avoided; also tough, stringy and fibrous vegetables.

Much has been said both for and against the use of milk in fever both by ancient and modern physicians. The opinion of Hippocrates on this subject, as on many others, I conceive to be founded on experience and truth. "It is bad," (says he) to give milk in head ache. It is also bad to give milk in a fever, as likewise to those who are thirsty and troubled with flatulence, it is prejudicial where there are bilious stools or acute fevers."† Sweet milk is particularly objectionable in fever. As the stomach is weak, the function of digestion is but imperfectly performed: and it is well known that fresh milk, upon being received into the stomach is immediately coagulated by the action of the gastric fluid and converted into cheese; in which state it lies as a heavy indigestible load upon the stomach, producing heat, irritation and fever, and after being imperfectly digested furnishes nutriment for the bile, and food for the disease. Clabber, whey and butter-milk, having been robbed, in a considerable degree of their rich and oily portion, and having lost the property of being converted into cheese by the action of the gastric fluid, are less objectionable than sweet milk, and appear to be the only forms of this article that can be used with impunity in fever. Riding on horse back in the cool of the day, or in the shade, is a wholesome and invigorating remedy. In using exercise, however, of all kinds, care should be taken not to carry it to the point of inducing much fatigue, otherwise its good effects will be

* Si febricanti quis cibum exhibuerit, sine quidem robor, et ægrotanti morbus. *Hippoc. Aph.* 67, *Sec.* 7. Dr. Huxham, speaking of the epidemic fever of June 1740 says, "If any one made use of flesh or fish diet, unless he had been very well purged, and his recovery confirmed, he infallibly indulged himself herein at the utmost danger of his life; nor did he often run a less risk from a more rough cathartic." *Huxham on Epidemics Vol.* 1, *p.* 67. "Solid animal food," says Dr. Fordyce, "even such as is of the easiest digestion, such as fowls and white fish of a moderate degree of firmness, as whitings, have been the cause of the greatest number of relapses when used after a crisis, or by a convalescent, that have come within the knowledge of the author. *Fordyce on Fever, Vol.* 2 *Of Regular Continued Fever part* 1, *p.* 200. The injurious effects of animal food in convalescents from yellow fever was observed by Dr. Rush in the epidemic of Philadelphia in 1797.

† *Hippoc. Lib.* 5, *Aph.* 64.

counteracted; nor should any be attempted which requires much exertion. The patient should confine himself mostly to the house till his health and strength are in some degree restored.

Persons who have suffered attacks of the bilious remittent, are often subject to a lingering and tedious convalescence; or in other words, remain in an infirm valetudinary state for a considerable length of time, for weeks, and even for months, during which they are from time to time subject to irregular attacks of fever, chills and fevers, and of fever and ague; the types frequently changing and interchanging their forms. In this situation the patient should take daily, during the intervals of the fever, some vegetable tonic; of these the bark is, generally the most useful; though on many occasions I have found a mixture of bitters and aromatics to succeed where the Peruvian bark has failed.‡ The bark should be taken as already directed. The *chills and fevers*, as they are called, may also be prevented by taking the diffusible stimuli, as opium, laudanum, paragoric, &c. (as already pointed out under the cure of intermittent fever) about an hour before the period of accession, when this is known. In addition to the use of vegetable bitters, where there is considerable debility, with a luecophlegmatic habit and a disposition to dropsical affections of the extremities, the muriated tincture of iron, in the quantity of fifteen or twenty drops, three times a day, may be exhibited with the best effect.

‡ The prescription I make use of on these occasions is as follows:

Take of Quassia, Gentian,
Virginia Snake Root, Columbo, each half an ounce.
Canella Alba,
Flowers Chamomile, each two drams.

Boil the ingredients together, moderately for half an hour, in three pints of water; decant when cold, add two gills of spirits, and keep the decoction in a bottle or bottles, well stopped. Of this the patient or invalid is directed to take a wine glass full five or six times a day.

AN ACCOUNT

OF THE

BILIOUS REMITTING OR ENDEMIC FEVER

OF ALABAMA,

AS IT APPEARED IN CAHAWBA AND ITS VICINITY

IN THE

Summer and Autumn of 1821.

Upon taking a survey of the circumstances which accompanied this wide spread malady, we are forcibly reminded of the causes which have been enumerated in a preceding part of this work; and their influence in the production of disease is strikingly exemplified in the instance now under consideration.

Heat and moisture have already been considered as essential causes in producing a vitiated state of the atmosphere, and in the consequent generation of endemic fever. With a knowledge of this fact before us, we need not wander far in quest of an explanation of the origin and propagation of this extensive calamity.

The quantity of rain that fell late in the spring and during a very considerable part of the summer months was almost unprecedented in the recollection of the oldest inhabitants. The low grounds and swamps adjacent to the Alabama and the Cahawba rivers were frequently inundated during the early part of the season; so that it was late in May before many of the farmers on the rivers had an opportunity of planting, owing to the highness of the water. A considerable fresh or rise of the river took place in July; and such was the quantity of rain that fell early in the summer that many of the farmers were entirely frustrated in their attempts at planting; the earth being so completely wet and inundated that the seed rotted in the ground; so that many were obliged to plant the same field three or four times; and then, in several instances, were doomed to lose their labor, and abandoned the undertaking as hopeless.—The same excessive quantity of rain appears to have given origin to an infinite generation of worms, which, by seizing upon the small remains of the crop that the rain had suffered to vegetate, made clean the work of destruction.—Such, indeed was the situation of affairs, in many instances, upon the river; in others, less injury was sustained, and upon the uplands, remote from the river, the crops came forward with considerable certainty and success. Even there, however, crops of corn and cotton were injured by the excessive rains, and replanting became a business of equal necessity.

This peculiarity in the wetness of the season appears not to have been confined to Alabama, but extended generally through the southern states; committing waste and destruction during its continuance, and depositing the seeds of an infinite progeny of diseases.

The average range of the thermometer during the month of June was, at 7, A. M. 73°—2, P. M. 85°, and at 9, P. M. 77°.

During the same month in Philadelphia, in 1793, the average range of the mercury in Farenheit's thermometer was at 7, P. M. 66°, and at 2, P. M. 77°

Throughout the month of July, the average temperature, as indicated by the same thermometer was at 6, A. M. 71°, at 3, P. M. 84°, and at 9, P. M. 75°; making a mean temperature through the day and night of 76⅓°.

During the same month in Philadelphia in the fatal year of 1793, the average range of the mercury in the thermometer at 6, A. M. was 71°, and at 3, P. M. 80°.

During the prevalence of the yellow fever in New-York in 1795, the average range of the thermometer in June was at 8, A. M. 66°, at 1, P. M. 74°, and at 6, P. M. 66°. In July, at 8, A. M. 71°, at 1, P. M. 77°, and at 6, P. M. 78°. In August, at 8, A. M. 74°, at 1, P. M. 80°, and at 6, P.M. 75°.*

During the sickly months of August, September and October, my time was so much occupied in visiting the sick, that I was unable to register the state of the thermometer. Throughout the month of August, I should judge that the temperature of the weather was not below that of July; nor was there any perceptible change until the latter part of September. We are informed by Dr. Hillary that in the island of Barbadoes the thermometer never falls below 70° in the coolest mornings, nor rises higher than 86° in the day time.† This may be considered inferior to the heat of the summer months in the state of Alabama, where I have frequently observed the thermometer as high as 90 and 96° in the passage of a tolerably cool house.‡ In the state of Ala-

* See Webster's Collection of Papers on Bilious Fever.

† On the Diseases of Barbadoes.

‡ It is worthy of remark that the range of the mercury will be very materially influenced by the situation. Thus, in the same town there is often a difference of several degrees in different thermometers. If the building is small, without ceiling or plastering, and not sheltered from the heat of the sun by the shade of trees, the thermometer will rise considerably higher in the heat of the day than it will in one that is well finished, large, airy and well shaded. So that in judging of the temperature of a place it is necessary to understand the situation of the thermometer.

bama we certainly have a much longer continuance of hot weather, as well as a higher range of temperature during the summer months, than is found to prevail in the states of New-York and Pennsylvania. To this circumstance it is owing that the inhabitants of Alabama are more subject to summer and autumnal diseases than those of the northern states.

In addition to the usual causes of disorder which exist in some of the older states, the inhabitants of Alabama were exposed to those which are inseperable from the first settlement of a country. Much timber had been killed, and a considerable quantity of land brought suddenly into a partial state of cultivation. The consequence was that much vegetable matter was left to rot upon the surface of the earth, and the accumulated mould of ages was exposed to the action of the sun and air, without a sufficient quantity of plants and herbage to appropriate entirely to their nourishment and growth the otherwise noxious products of decomposition. Besides, from the floods of rain that had fallen during the earlier part of the season, a great quantity of decaying animal and vegetable substances was washed from the slopes and acclivities of the hills, and deposited in the adjacent low grounds and swamps. By long continued maceration, this corruptible matter had become so softened and subdivided as to be operated upon with the greatest facility as soon as it should be exposed to the action of the sun and air. Accordingly towards the latter part of July, when the rains had measurably ceased, the water of the ponds and marshes considerably evaporated, and the river had fallen within its banks, the work of putrefaction went on with rapid strides, and disease began to make its appearance.—During the continuance of the rainy season the country was healthy; but when the swamps and low grounds, which had been previously inundated, became exposed, decomposition was immediately excited in the offensive mass of mouldering materials, and the atmosphere was speedily contaminated.

It may, perhaps, be laid down as a physical fact that the sickness of any situation subject to endemic fever, will be in proportion to the quantity of rain and wetness of the spring, and to the heat of the succeeding months. Thus, when the spring is dry and the summer cool we may calculate upon a healthy season; and on the contrary, when the spring is unusually rainy and the summer extremely warm, we can scarcely be mistaken in prognosticating the prevalence of disease; or should the spring and summer both continue dry, the season will be generally healthy.

In the month of August the putrefactive process had arisen to its height, and at this time, it was almost impossible to ride through the town or country, or turn a corner without being assailed by a disagreeable and noisome odour, resembling that of a sick room, where two or three patients are confined with the worst kind of bilious fever. This smell was most perceptible at the still and damp hour of twilight, when the morbific miasms, not being dispersed and scattered by the wind, were suffered to accumulate in the vicinity of the mouldering mass from which they originated, and by attaching themselves to the particles of the falling dew, diffused themselves in the atmosphere around. Of these mouldering ruins of animal and vegetable growth, and hot beds of disease, there was no scarcity.

As the disease arose from natural causes, too extensive, perhaps, for human controul, so by a suspension of the same powerful energy, the evil was at last checked in its career; and mankind were again permitted to draw the breath of life without inhaling the seeds of pestilence and death.

We know not to what degree the air which we breathe may be corrupted without endangering health, but that it may be so to a certain extent, there can be no doubt. Thus, decomposition takes place at a temperature considerably below that which is necessary for the production of bilious or yellow fever: and in every climate and country this process goes on to a greater or less extent during the summer months. Now, the natural effect of this decomposition is to vitiate the atmosphere; yet in high northern latitudes the inhabitants remain perfectly healthy, at least, entirely free from any thing like the endemic fevers of hot and tropical climates. From which it appears that it is only when the aerial products of decomposition exist to excess in the atmosphere that they become the source of derangement and disease to man. Nor is our atmosphere ever entirely free from this impurity and the contamination of heterogeneous admixtures.

There is a power inherent in the constitution, which the older physicians denominated *vis medicatrix naturæ*, by whose agency they endeavored to explain every obscurity in physical investigation. This power it is that enables the system to resist, to a certain degree, the injurious tendency of hurtful impressions. Were it not for this inherent principle of preservation, life would be in continual danger. Poisons and deleterious substances, within certain bounds, are received into the stomach with impunity, and tainted air is breathed without infection. But there is a limit to

this salutary agency, beyond which nature, in vain, endeavors to oppose resistance. So in the instance under consideration, the air had become highly charged with miasmata, and it was no longer in the power of the human constitution to withstand their morbific influence.

Cases of intermittents and remittents, which yielded with facility, at first prevailed; but a rapid increase in the virulence of the morbid poison soon produced a corresponding aggravation in the malignancy of the symptoms; so that it at length became clearly and satisfactorily established in my own mind, that it was completely in the power of a similar agency to that which gave rise to this disease, by an augmentation in the virulence of infection, to produce every symptom of the most fatal plague.

That the atmosphere may be so vitiated as to produce instant death, numerous facts satisfactorily prove. And what might be the effect of absolute purity in this element in prolonging the term of human existence, we are unable clearly to determine. But that its influence, in this respect, would be very considerable, there can be no doubt. And though there are various causes by which the constitution is impaired, yet the healing influence of a salubrious atmosphere, perfectly free from every impurity, might be sufficient to counteract the operation of other hurtful agents through a long succession of revolving years.

Constitutional peculiarity had considerable influence in modifying the operation of physical causes. Thus the inhabitants who had migrated from unhealthy countries, as the Carolinians and Georgians, suffered comparatively little. Amongst persons from Tennessee and Kentucky, from the northern states, and from Europe, on the contrary, the disease was peculiarly malignant. Thus it appears that a long familiarity with unwholesome smells and noxious exhalations renders the body, in a great degree, insensible to their presence. In illustration of which we are informed by Dr. Rush, that in the yellow fever which prevailed in Philadelphia in 1793, out of nearly one hundred butchers who remained in the city, three only died with the disease; and that out of forty scavengers who were employed in collecting and carrying away the dirt of the streets, only one was affected with the fever and died.

According to my observation, the disease was less severe upon negroes than upon white people; though the difference in this respect was by no means so striking as has been observed by others. Thus, we are informed by Dr. Hunter, in his work on the diseases of the army in Jamaica, that

scarce one in thirty of the soldiers sent out on the St. Juan expedition survived it; yet not one of the negroes who had accompanied them died on that duty; and what renders the circumstance the more striking, is that the blacks were employed in all the hardships and dangers of the enterprize. Dr. Lining has remarked that the negroes in Carolina were not subject to the yellow fever. The same thing was observed by Dr. Curtis in the island of Jamaica. Dr. Warren, in his account of the yellow fever of Boston, in the summer of 1796, observes that he did not know an instance of a black person being infected.* We are informed by Dr. Seaman that the yellow fever of New-York in 1795, was less fatal to the negroes than to the white inhabitants, and that none of the French emigrants from the West Indies were affected by it.† "The African negroes," says Lord Kaimes, "though living in the hottest known country, are yet stout and vigorous, and the most healthy people in the universe."

We find that nature in the benevolence of her operations kindly adapts the constitution of man to the various necessities of his situation. Thus, a climate which at first was sickly and pestilential to a native of a cold and salubrious country, becomes at length, comparatively innoxious.—With the clime he also changes his complexion; and it has been uniformly found that the sable color of the African is the best possible protection against the otherwise scorching operation of a vertical sun. The skin of the negro is always moist, and his perspiration free and unobstructed; and it seems to be owing to this great evaporation from their surfaces, that the jet black negroes of Sarnar, the hottest country in the world, are two degrees cooler than the Europeans. Climate, in thus altering the color and complexion, adapts also, the constitution to the change of situation. Beekman, in his voyage to and from Borneo, (Lon. 1718) and other navigators assert that on the coast of Guinea, and in various parts of the torrid zone of Africa, many of their domestic animals, and particularly their dogs and common poultry, as well as the human race, are uniformly black. Whereas, towards the polar regions, white, as being a warmer colour, is the common livery of the animal world; and in many quadrupeds of these latitudes the colour is observed to change with the successive vicissitudes of summer and winter.

* Med. Repos. Vol. I. p. 135.

† See a Collection of Papers on Bilious Fevers, by Noah Webster, p. 6 and 7; a book less known than its merit deserves.

With regard to the greater exemption of Africans from the endemic fevers of hot and tropical climates, much is, no doubt, owing to the circumstance of their being natives of the country; which, as already observed, whether in white or black, operates as a security against endemic diseases. We know, besides, that the negroes can endure the heat much better than white persons: and their colour is found by philosophical experiments to be the best possible protection against the excessive temperature of the torrid zone. Heat radiates more freely and readily from a black surface than from one of any other colour, and thereby affords in the negro a more effectual protection to the subjacent integuments. It also appears that the perspiration of a negro is more free, and less liable to obstruction than that of a white man.

The fever of which we are treating was particularly malignant when it attacked habitual drunkards, or those who indulged in the excessive use of spirituous liquors. Many had imbibed the notion from the votaries of the glass, that provided they kept themselves *above fever heat*, as they expressed it, they would be secure against the prevailing disease. How far this practice was successful I have not been able precisely to ascertain. I knew several who drank their pint of brandy or whiskey a day, and escaped the fever.—This much, however, is certain, that when the disease attacked *hard drinkers*, the symptoms ran rapidly into the typhus state, from which no power in medicine could raise them. It was at one time adopted as a principle in medicine that no two general diseases can exist together in the same person. According to this doctrine, habitual intemperance might be considered as a disease, and during its continuance, might protect the body against the prevailing epidemic. Or, perhaps, to come nearer to the truth, we might say that intemperance fortified the body, or produced a degree of insensibility in it to other morbid poisons, in the same way as opium and other narcotics prevent the return of the fever and ague. But, in order to insure this effect the habit of intemperance must be constant, regular and uniform. The experiment is hazardous; and the wretched instances of the destructive effects of the intemperate use of spirituous liquors, are demonstrated every summer in the southern towns and sea-ports of the United States; where it is not very uncommon, to find in the morning, in some public place, one or more who have fallen victims to intoxication, and to the consequent exposure to the unwholesome damps and vapours of the night. An instance of this kind occur-

red in Cahawba in the summer of 1821, in a man to whom drunkenness was familiar; with his handful of clothes he had left the town with the intention of proceeding to Portland, a small village fifteen miles distant, but, unfortunately, he fell short in his calculation. He was found the next day at a spring in the vicinity of Cahawba, with his little bundle beside him, and free from any marks of external violence. His bottle had become exhausted, and his lamp expired. Flies and insects had taken possession of his lifeless body.

Dr. Drisdale, in his account of the yellow fever of Baltimore in 1794, observes that all the first victims of this disease, were persons habituated to the immoderate use of ardent spirits; and asserts it as a melancholy truth, that very few of these unfortunate creatures could be rescued from death by all the powers of medicine. "In drinkers of ardent spirits," says he "the fever was excited not only with more facility, but was attended, also, with almost irresistable violence and malignity."* It was remarked by Dr. Caldwell in the yellow fever of Philadelphia in 1805, that habitual drunkards, when attacked by this disease, were its most certain victims; and that he did not recollect either to have seen or heard of a single recovery in a patient of this description.†

There can be little doubt that a scarcity of good and wholesome vegitables had a considerable share in producing a predisposition to this disease. It was seldom that any article of culinary growth was brought to market or offered for sale. And it is to be regretted that a disregard to gardening and to the cultivation of wholesome vegitables is so generally prevalent. The settlers in this country should consider that they cannot here enjoy, during the summer months, the same salubrious air which they were accustomed to breathe on their native hills in Tennessee and Kentucky; and what would there be safe and salutary is here dangerous and unwholesome. Upon the article of diet I have already dwelt at considerable length in the preceding pages. I will here just repeat that the more entirely a person abstains from the use of animal food, during the sickly season, the greater will be his security from disease. There is a mutual co-operation between the influence of animal food and that of the noxious miasmata of decomposition. They both have a tendency to vitiate the fluids of

* Cox's Phila. Med. Mus. Vol. I. p. 30.

† Essay on the Yellow Fever. Appendix to Alibert on the Malignant Intermit. p. 79.

the body, producing in them a morbid alkalescency, giving rise to the formation of an undue quantity of poisonous bile, deranging the healthy functions of the animal system, and acting reciprocally both as the predisposing and exciting causes of disease.

By the careful regulation of the diet many cases of disease would be checked in their formation: And if when persons feel the first symptoms of approaching fever they would restrict themselves to a sparing diet of vegitable food, with the use of some moderate cathartic, as rhubarb, castor-oil, salts, or two or three teaspoon fulls of cream of tartar, which with a few grains of rhubarb is one of the best purgatives in the Materia Medica, they would generally escape the threatened attack of disease. There are some, however, who are such slaves to appetite, that to them all counsel and advice upon this subject would be useless and unavailing. By them every privation is considered as an insupportable hardship, "sufficient for the day is the evil thereof," is their adage; "life let us cherish," their motto.—When such are the sentiments and practice of many, we need not be surprised at their suffering for their imprudence.

During the early part of the season of 1821, fever and agues, and mild remittants had been common; and as they yielded without difficulty, and were attended with little danger, they excited no alarm or apprehension. The summer continued tolerably healthy until towards the latter part of July, when the disease began to assume a character more obstinate and severe. In the month of August, the fever became still more malignant, putting on more of the continued form with a tense pulse.

For the first two days of the disease, in many cases, there was little or no remission. In other cases a severe chill ushered in the complaint, with general pains in the head, back and limbs, and the fever went off after a continuance of from eight to twelve hours. Sometimes the invasion was marked only by a slight sensation of cold without any shivering—in others the fever arose without any perceptable chill whatever; though in the majority of cases a greater or less sensation of cold or chilliness was perceived at the invasion of the complaint; and I found it to be an invariable law of this disease, that the more severe the chill, the less dangerous was the disease. But when, as often happened, the fever came on without any sensation of coldness in any part of the body, I had reason to apprehend a dangerous and obstinate case. It was observed by Mr. Cleghorn, that the most severe paroxysms of fever which occur-

red in his practice, were those that commenced with a burning heat, without any previous cold fit.* The same thing was noticed by Dr. Gregory and by Sir John Pringle. This distinction in the character of the fever I ascertained at an early period of the epidemic, and it was among my first inquiries addressed to the patient, whether the paroxysm came on with, or without an ague or chill. Their views upon this subject were quite different from mine, until convinced of their error by personal experience.

There was in all a great accumulation of black, tarry, and dark green, bilious and very offensive matter, which was discharged in immense quantities by the exhibition of an emetic or cathartic; and such was the disposition to this accumulation, that the frequent exhibition of purgatives became necessary to carry off the offending matter. The discharge of bilious and offensive colluvies, procured by the operation of a cathartic was immense, and sometimes continued for the space of twelve hours, with but little abatement; the stools still remaining black and offensive to the last.

In several instances the matter discharged from the bowels, though of a black color, was free from any offensive odour. It was sometimes dark and grumous, and often of a flaky appearance, resembling a mixture of soot and water. In some a similar matter was discharged from the stomach by vomiting. After the second or third day the bowels were apt to become constipated.

On some occasions a yellowness overspread the body, appearing first upon the face and breast; and what was somewhat remarkable, this yellowness was, in some instances, increased by the operation of a cathartic, and again diminished when the bowels were at rest. It would seem from this that the purgative, though it dislodged the bile from the bowels, increased the activity of the lymphatics, and rendered the absorption of bile more abundant.

There was, during the exacerbation of the fever a tense and strong pulse; and but little abatement of the tension took place during the remission.

As to the remissions of the fever there was great variety; in the early part of the season remissions were apt to take place after the first twelve or twenty-four hours from the invasion of the fever; and then the disease generally attacked with a chill more or less severe; but subsequently, in many instances, the fever came on without any chill or

* Diseases of Minorca.

shivering, and often continued for twenty-four or forty-eight hours. In others a complete intermission took place on the second day; and the patient flattered himself that *the fever was broke*, but the ensuing day convinced him of his error; for the fever returned with increased violence. It was apt, however, to remit towards the close of the day; though in this there was not much regularity; for it often happened that the exacerbations did not take place till towards evening, and sometimes they came on at night, tho' this was not common.

It generally happened that the fever preserved more or less of the form of the double tertian, the patients being worse and better on alternate days; a slight fever one day was succeeded by a more severe one on the ensuing, and *vice versa*.

The return of the paroxysms took place, sometimes with, and at others without a chill; though in the worst cases no coldness was perceptible; but after an imperfect remission the fever again rose imperceptibly. Nor was there much regularity in the recurrence of the exacerbations. I have known the fever to rise and fall a dozen times in the course of the day; the pulse, at one time, being full, strong and tense, and the skin hot and dry; and again, in a few minutes, the perspiration would break out, the surface become cool, and the pulse weak, soft and frequent. In some cases the fever would continue two or three days without anything like a remission.

The urine was often high colored, and of a yellowish green, or deep saffron hue, being strongly impregnated with bile. This was more especially the case when the skin was at the same time suffused with a yellow tinge; upon standing a little while it became of a dark red or brownish color, bearing a great resemblance to the strongest lie.

One remarkable feature of the disease was proneness to prostration of strength. Sometimes this was the effect of evacuations procured by emetics or cathartics. At other times it took place early in the disease from the violence of the causes which occasioned and supported the complaint. In both instances there seemed to be a deadly poison in the system which rapidly sunk and destroyed the powers of life. This prostration would sometimes come on suddenly after one or two operations of a dose of tartar emetic, especially if it had acted upon the bowels so as to produce one or two copious evacuations by stool. In persons of robust constitutions who one hour before had a high fever with a strong and tense pulse, I have known this prostration to

take place to such a degree that the extremeties became as cold as marble and the pulse imperceptible. Where the prostration took place from the effects of medicine it was often recovered from, but when it came on spontaneously towards the termination of the paroxysm it was generally irremediable; indicating the total exhaustion of the vital principle, or the mortification of some internal viscus, as the stomach or bowels.

In many there was a remarkable variety of nervous affections, such as twitchings and tremulous motions of the muscles, rendering the limbs unsteady; the tongue quivered and trembled when protruded from the mouth; the head, when the patient laid upon his back, moved from one side to the other. These symptoms I remarked to be unfavorable. During the exacerbation, the intellect was often deranged, and sometimes completely destroyed, the patient losing all consciousness, and lying in a state of stupor.—Sometimes a ray of understanding still glimmers on the mind, rendering the patient sensible to distress, which was expressed in low muttering, tossing of the arms and legs, and other agitations of the body. In some cases the patient's derangement rose to the wildest extravagance, causing him to start with horror from the bed, making some fearful exclamation that he was assailed by savages and monsters; and the strength of several persons became necessary to confine him.

In the advanced stage, typhoid or asthenic symptoms supervened; and the patient was affected with an irresistable propensity to sleep. Upon falling into this lethargic slumber he was apt to be assailed by frightful dreams, and would suddenly start, perhaps with a scream in a state approaching to suffocation. The pulse was here frequent, and had lost much of its tension; but the alvine discharges still continued bilious and offensive. The tongue was dry, rough and chopped; a clean or black streak often running through its middle, and a white list extending along the margins.

The skin in the hot stage was dry, hard, crisp, and constricted: the body, to the hand, feeling like a block of heated wood.

Upon the decline of the hot stage, the circulation at first grew languid in the extremeties, which often became cold; though there might be at the same time, a violent pulsation and throbbing of the heart, as might be perceived upon applying the hand to the bosom, or even by the visible motion of the thorax.

Early in the month of October, the symptoms again underwent a change. The tongue was clean and moist, even in the most severe cases; though the tongues of persons in ordinary health were all more or less furred; showing that all were impregnated with the morbid poison or matter of fever. Headache was common. The urine was small in quantity and high coloured, giving a red tinge to the linen wherever it touched, and was sometimes thick and viscid, appearing to consist principally of vitiated bile. This was remarkably the case in one patient, Mr. Morong, whose body was at the same time of a dark olive hue, from the suffusion of bile. He recovered. In other cases the urine was copious and limpid. The body, neck and breast, frequently turned black soon after death; when this was not the case, it generally turned to a deep yellow.

The nervous system was much affected and deranged.—The patient's senses were stupified with profound coma, from which he could scarcely be roused for a moment—this was an unfavorable symptom. In the typhoid state delirious raving supervened.

The patient was affected with strange feelings and fancies, sometimes imagining himself divided into two or three parts, that one part imposed upon the other, or did not bear an equal share of the suffering, &c.; the mind was disturbed with frightful dreams and appalling apparitions, whenever the patient fell into a slumber.

In the case of a young gentleman, by the name of Brooks, to whom I was called in the advanced stage of the disease, and which case terminated fatally, I recorded the following assemblage of symptoms:—Tongue firey red at the tip—white fur extending along the sides—papellæ swollen and protruded—delirious raving—constant motion of the lips, the patient appearing to be talking to himself—perpetual restlessness, tossing of the arms and legs, rolling from one part of the bed to the other; frequently changing his position from a horizontal to an erect posture; desire to escape from confinement, and to throw himself out of the window—coldness of the extremeties and surface, though the pulse possessed considerable strength, and was not much increased in frequency—complained of great heat, whilst the body to the touch was colder than natural—unwilling to be covered in bed—extreme restlessness and anxiety. When asked how he felt, he was excited to momentary attention, and replied, "I feel like a crazy man." He discharged before his death, some large round worms by vomiting and stool, together with dark coloured matter. From the coldness of

the body he was put into the warm bath, by which he was somewhat composed, whilst for a few minutes he remained in it; but no kindly perspiration and gentle warmth succeeded—his body, in a short time, after being taken out of the bath, became intensely hot, and the pulse frequent and feeble. I pronounced him past all hopes of recovery when I was first called to him, and I was not mistaken in my prognosis.

The yellowness frequently appeared upon the body at an early period of the disease, viz: the second or third day. The appearance was often sudden and universal at the same time.

The appearance of long round worms, which were often discharged from the stomach and bowels, did not in itself afford any prognosis; though as far as my observation extended, it was confined to the more severe cases of the disorder, and took place chiefly in children and young people.

The eye exhibited various appearances. It was dim, lurid and suffused with tears, or glassy, vacant and inanimate; sometimes red and blood-shot, with an intolerence of light; at others, sunk and insensible to surrounding objects.

In some, eruptions appeared upon the surface of the body, more especially upon the face, in the form of watery blisters, which, upon breaking, formed into blackish scaly incrustations. They commonly first made their appearance about the mouth and nose, and in a short time become general. These eruptions indicated, as old authors would say, a rapid tendency to putrefaction; as in persons affected in this way, signs of mortification appeared immediately after death.

Hæmorrhages from the nose were common, and sometimes blood was discharged from the stomach and bowels. In one or two cases I observed grumous blood mixed with the urine.

The matter discharged from the stomach, either from the exhibition of an emetic or spontaneously, was of various appearances; the most usual, after the fluids recently taken in had been discharged, was a deep yellow viscid bile. In many instances vast quantities of this were discharged by the operation of a single emetic; in others, the matter rejected from the stomach was of a grass green color, but much less in quantity than the preceding, and not uniformly blended, but of a flaky viscid appearance, with a mixture of slime or mucus. In some this matter appeared of a dark brown, in others approaching to black.

The black discharges which took place from the bowels, as already described, I took to be the same as what is cal-

led the black vomit, though it was discharged in immense quantities. Generally it was not perfectly black, and stained the linen of a dark green colour. When it was entirely black, it was for the most part free from fœtor, and entirely inodorous. The generation and reproduction of this matter was astonishingly great and rapid. I do not think that I shall be guilty of any exaggeration, when I say that I have known from a gallon to two gallons of this black matter to be discharged daily from the bowels, for four or five days successively: so strongly was every part of the human frame infected with the pabulum of disease, that there seemed to be a disposition in the system to convert the whole animal substance, both solids and fluids, to this same black, carbonacious and vitiated colluvies. These discharges were commonly more offensive at the commencement of the disease, and became less so during its progress. Sometimes the alvine evacuations were small in quantity, free from fœter, and of a flaky and ash-coloured appearance.

The disposition to drink was various; though commonly there was a great inclination for cold water. Acids of all kinds were generally very grateful. In many cases there was an excessive thirst, attended with great irritability of the stomach, which occasioned the fluids to be rejected as often as they were received. In such cases I was sometimes obliged to prohibit drinks of every kind, except in very small quantity, for several hours.

The blood drawn in this disease was generally dense, black and cohesive, and free from that attenuated and dissolved condition which authors describe as characteristic of putridity in malignant diseases. Not unfrequently the crassamentum was covered with the buffy coat, as in cases of local inflammation.

Throughout the summer there were scattering cases of intermitting fever, which yielded to the ordinary remedies in that complaint; though in some instances where this mild appearance of the disease was neglected, I have known it suddenly assume the symptoms of the bilious remittent in its most aggravated form. It was this tendency to assume the character of the prevailing epidemic that rendered every indisposition a cause of fear and apprehension: and many cases which appeared slight, and scarcely worthy of notice at their commencement, by neglect soon become dangerous and alarming.

Sweats were more common at the close of the first and second exacerbations than at subsequent periods. After the first or second day it was not uncommon for the skin to

become dry and constricted, and perfectly impervious to moisture.

The temperature of the surface of the body was various, independent of any thing connected with the remission of the fever. Not unfrequently it was below the natural standard, more especially in the advanced stage of the disease, or where the vital energy appeared to be suppressed and subdued by the violence of the causes which supported the disease. In others the heat was violent and intense; and in a few cases I discovered that burning caustic sensation to the touch, which authors describe as characteristic of malignant fevers. This sensation was more perceptible immediately before the sweat broke out upon the surface.

A burning heat and distressing sensation at the pit of the stomach were not uncommon; sometimes these amounted merely to a slight uneasiness, or a sense of weight and oppression; at others it arose to a great difficulty of breathing and suffocating sensation.

At the invasion of the paroxysm some were seized with violent pains in the stomach and bowels, together with severe and excessive vomiting. It was frequently in vain to attempt to restrain this affection by the exhibition of medicine by the mouth; for the mildest as well as the most agreeable and cordial drinks were alike rejected, being often expelled with such violence as to be thrown across the room, provided the patient was in an erect position.

The vomiting, however, was not confined to any particular period of the complaint, but in such persons as were subject to it, who indeed were many, it continued to recur at intervals throughout the progress of the disease.

Dysenteric symptoms were not uncommon. When these took place, the fever, in a great measure, or entirely disappeared, and again returned upon the cessation of the dysenteric affection. This form of the disease was not peculiarly dangerous, but generally yielded with facility to proper treatment.

The sanguiferous system was variously affected in this disease. In the early part of the season, during the exacerbation the action of the arteries was increased in force and frequency, though there was little or no tension perceptible to the touch. Towards the latter part of August and throughout the remainder of the sickly season, which continued till the 20th of October, the symptoms became more inflammatory, with a frequent, strong and tense pulse; such, at last, was the state of the arterial system at the commencement, but it frequently happened, upon the subsid-

ence of the first exacerbation that the arterial action became weak, thread like, frequent and almost imperceptible. This debility of the blood vessels was of various duration ; sometimes the pulse rose on the second or third day, in others this state continued for seven or eight days, when the arterial action again developed itself in strength and fulness. In one patient, Mr. LaTourette, who fell a sacrifice to this disease, the vascular system never acquired any strength and fullness after the first twelve hours ; but throughout the disease there was a great prostration of the vital action; whilst at the same time the strength of the muscular system was disproportionably great. This young gentleman was affected with inexpressible anxiety and restlessness. Remonstrances and intreaties were alike ineffectual in confining him to the same situation. He would occupy successively, and in a short time every bed in the chamber, and such was his muscular strength, that, without any apparent difficulty, he would walk from one part of the room to the other, though, at the same time his pulse was scarcely perceptible. He was constantly complaining of a distressing sensation of heat, and insisted upon being exposed naked to the open air, whilst his skin, to the touch was below its natural temperature. His bowels, after the first twenty-four hours, became constipated, and no medicine though aided by injections could be brought to act upon them ; nothing was discharged but a little inoderous, clay, or ash colored flaky matter. Till within about twenty-four hours of his dissolution his intellect remained free from derangement. It was painful and distressing to behold the closing scene of this amiable young man ; with an agonized body and distracted mind he was constantly giving expression to his delerious wanderings. Since the commencement of his fatal indisposition sleep had not closed his eye-lids, nor had slumber soothed into soft oblivion his disordered senses ; and when in the stillness of the night he would endeavor to compose himself to rest, strange phantoms and terrific apparitions of uncreated horrors immediately arose in dread array to his imagination : waking was wretchedness, but these fitful visitations of distempered slumber were dreadful in the extreme. " His mind, like his body, lay in ruins, in scattered fragments of disordered thought." These imaginary terrors were not peculiar to himself alone, many complained of the same dreadful and distressing phantoms.

A disregard to modesty, in the exposure of the body, was an unfavorable symptom. The same thing was observed by Dr. Rush in the bilious yellow fever of Philadelphia in 1798, and by Boccacio in the plague in Italy.

An impatient desire to ride into the country was a fatal symptom, where it occurred in severe cases.

The inequality in the distribution of strength, between the arterial and vascular systems, constituted a striking feature of this disease. Sometimes, though much more seldom, the reverse of this took place; the pulse indicating considerable strength of vascular action, whilst the debility of the muscular and nervous systems was so great, that the patients were unable to continue, even for a few moments, in an erect position in the bed. Even the exertion of remaining for a few minutes at the close stool has produced an alarming state of syncope. The variation of muscular strength was observed in the yellow or bilious fever of New-York in 1795, by Dr. E. H. Smith.*

There was one circumstance worthy of particular notice in treating of the affections of the vascular system, and that was the violent palpitation of the heart, which was observable in cases of high excitement. This was generally accompanied with an intense heat of the surface, great pulsation of the carotids and throbbing of the temples. Notwithstanding this palpitation and irregular action of the heart, the pulse at the wrist, though frequent and tense, was at the same time perfectly regular: to this, however, there were some exceptions, more especially in the advanced stage of the complaint, when with the continuance of this palpitation the pulse became weak and intermitting.

In a few cases the pulse was slower than natural, at the same time intermitting every second, third, fourth or fifth pulsation.

Towards the decline of the first or second exacerbation the pulse often became extremely frequent, and sometimes irregular and intermitting. Great prostration was apt to supervene, and there seemed to be an alarming indication of danger: in a few hours, however, the pulse would become softer and less frequent.

The pulse was not always a sure indication either of danger or of safety; nor could any accurate conclusion be drawn from it, unless taken in connexion with the other symptoms. Thus, I have known a pulse small, thead-like, scarcely perceptible, and going at the rapidity of 130 pulsations in a minute, in a patient whose symptoms were not otherwise alarming, and who recovered in the ordinary time. Again, I have known a pulse full, tolerably strong, and not much increased in frequency, in patients within twenty min-

* See Webster's collection of papers on bilious fevers.

utes of their death. It is not so much from the condition of the pulse as from the state and affection of the nervous system that the prognosis in this disease could be accurately formed. The age, habit and constitution of the patient had also considerable influence in varying the state of vascular action, and aiding in the formation of an accurate prognosis. In persons of delicate habits, especially females, the circulation is naturally weak, small and frequent: and symptoms that in a person of a robust constitution, would lead us to form a fatal prognosis, in one of a delicate and debilitated habit would, perhaps, be free from danger.

There was, in many cases a great determination of blood to the head. This was indicated by head-ache, violent pulsation and throbbing in the temporal arteries, hamorrhagies from the nose, stupor, aberations of intellect and violent delerium. It was this affection of the brain more especially that constituted a great part of the danger in this disease: Provided the head was tolerably free from pain, the patient composed and the intellect clear, the countenance calm, and free from anxiety and dejection, the patient might generally be considered free from danger, though at the same time there might be a degree of tension with increased frequency of pulse.

Hamorrhagies from the nose generally took place in the early stage of the disease, and were evidently owing to a great determination, and consequent accumulation of blood in the vessels of the head. Sometimes blood was discharged from the stomach by vomiting, and bloody stools were still more frequently observed. In some the flow of blood from the nose was very copious and obstinate; but its effects were generally salutary, though it marked an aggravated form of the disease.

The spleen, liver, lungs, stomach, bowels, brain and other viscera were often the seats of local congestion and a degree of inflammation. The liver and spleen were subject to considerable enlargement from accumulation and congestion of blood. The stomach, also, in many cases was affected with more or less inflammation; patients often complaining of a burning heat, pain and oppression at the epigastrium, being at the same time affected with sickness and vomiting. In like manner the bowels were more or less affected, as indicated by pain, tormina and flatulency. Patients often objected to taking nourishment and medicine, from their producing an uneasy sense of distention: According to their account, the substances taken had lodged in the upper part of the stomach, and were incapable of pro-

ceeding any further: A sense of choaking and fulness of the throat prevented their receiving any thing by the mouth, except in very small quantity at a time.

The pain and misery in the stomach and bowels was sometimes so violent and severe as to extort cries and exclamations of distress. Great anxiety pervaded the body, and the patient, writhing under the severity of his sufferings, was incessantly changing his position. The small of the back was often, likewise, the seat of severe pain, more especially during the height of the paroxysm.

Great constriction and constipation of the bowels often took place in this disease. The most drastic purges could sometimes only affect a very partial operation; a small discharge of flaky ash-colored fœces was often all that could be procured by the exhibition of a cathartic. The relief in such cases was but slight and imperfect, and repeated cathartics and enemata, became necessary to keep up anything like the natural peristaltic motion of the bowels. This state, however, generally yielded sooner or later to the exhibition of purgative medicines and the repeated use of injections.

The lungs were often more or less affected. Nor was this complaint entirely confined to the cool weather of autumn. A slight cough with pain in the side was common. In some cases these symptoms were almost as acute as in cases of idiopathic pleurisy; and the same treatment became necessary for their removal. In one patient I found it necessary to extract 76 ounces of blood in the course of a day and night, before this pain was entirely relieved, or the pulse considerably softened. In some cases these pains appeared to proceed from affections of the liver and spleen, which were liable to inflammation and enlargment. The pains, in such instances, were not confined to the seat of the inflammation, but extended into the shoulders, the arms, wrists and hands, affecting the deep seated parts, as also the lumbar region on one or both sides of the spine. An abscess formed in the lungs of one patient; and a short time previous to his death he threw up by coughing nearly half a pint of purulent matter. Sometimes the affections of the lungs observed periodical recurrences, abating, or disappearing entirely with the remission, and again returning upon the exacerbation of the fever. Mucus and not unfrequently blood were expectorated by the efforts of coughing.

There was often a collection of viscid phlegm in the throat and bronchiæ, which was expectorated or removed with difficulty, and became the source of great uneasiness to the patient; and sometimes death seemed to be occasioned by the

sudden effusion of phlegm and lymph into the air-cells of the lungs, thereby producing suffocation. This was more especially the case with children, many of whom were affected with the characteristic symptoms of the cynanche trachealis, or croup. I saw one patient to whom I was called late in this disease, in whom there appeared to have been formed an abscess in the stomach. This patient, two days previous to his death, threw up by vomiting, a considerable quantity of pus and the corrupted matter of supuration.

It has already been remarked that the brain was often affected in this disease: which appeared from the flushing of the face; heat of the forehead; pain in the head; hermorrhagies from the nose; coma; delerium; redness of the eyes, squinting; dilatation of the pupils; in some instances insensibilty to light, and in others an intolerance of light and noise. Sometimes the intellect was entirely destroyed, the patient being perfectly unconscious of every thing: in others a feeble glimering of intelligence remained; by loud speaking the patient could be roused to some degree of attention; he would open his eyes and perhaps answer in monosyllables to the questions addressed to him; but the spark was soon again extinguished in total darkness. Drinks, medicine, or nourishment might be forced into the patient's mouth in this situation, but as soon he became in any degree conscious of its presence it was instantly spit out. When an acquaintance, upon entering the room addressed him, he would perhaps, be roused to a momentary recollection, and express a satisfaction in seeing his friend. Mr. Joseph Bogle, a worthy and lamented young man, when roused from his lethargic slumber, by the address and inquiries of an acquaintance, replied, "I am very happy to see you, the presence of a friend is always agreeable, but particularly so in the time of sickness:" his understanding, however, glimmered only for a moment; it became exhausted by the slight exertion, and sunk into its former state of utter inactivity and apparent annihilation. When inquired of, how he felt, he would say, "quite well;" and again he would fall into his former state of profound stupor: it was the sleep of impending death.* Such cases, however, were but comparatively few: nor did all who were carried off with this disease, depart with this affection of the brain and nervous system; though few expired with a clear unclouded intellect. I knew of but two that died in possession of their understanding; one at the termination of the parox-

* Sopor profundus et altus omnino damnandus est. Hippoc. Coac. Prænot. Opera, Om. p. 119.

ysm, and the other from the exhaustion and debility of protracted illness: the former was Miss Caroline Campbell, the patient of a friend. I witnessed the closing scene of this amiable young lady. In the morning she was free from fever, and conversed cheerfully with her female friends and sisters; about noon she was taken with a slight chill, which was succeeded by a fever, upon the subsidence of which she died, about 9 o'clock P.M. As the fever went off her strength became suddenly and alarmingly prostrated. When I saw her, her hands and feet were cold, and her pulse feeble, faultering and scarcely perceptible. As life withdrew from the extremities, and retreated towards the heart, she became affected with extreme anxiety and distress. She was prevailed upon to take, from time to time, some wine sangre, yet she was too conscious of her situation to believe that it could be of any service. A short conflict between life and death put an end to her earthly sufferings.

Though death might take place without any material affection of the brain, yet when there was much derangement of the nervous system there was great danger to be apprehended. This state I have reason to believe arose in most instances from too great a determination of blood to the head, and from congestion in, and a degree of inflammation in the brain itself. This I infer from the symptoms which have been enumerated, as well as from the circumstance of its taking place only or chiefly in those cases where high arterial excitement had previously existed.

It is possible that the state of the weather may have had considerable influence in giving a particular cast and character to the fever. The influence of dry weather and dry situations in giving an unusual determination of blood to the head has been noticed by Dr. Hillary and Dr. Jackson in the fevers of the West-Indies; the same thing was remarked by Dr. Rush in the bilious remitting fever which prevailed in Philadelphia in the year 1793. As the summer of 1821, in Alabama, was not remarkable for dryness, but rather the contrary, the above consideration will not enable us to account for the affection of the brain; and we are therefore induced to attribute this symptom, or combination of symptoms to the general causes of the epidemic. This affection of the brain is also taken notice of by Dr. E. H. Smith, in his account of the yellow, or bilious fever of New-York in 1795, though the season was remarkably wet.*

* "The marks of congestion in the brain," says Dr. Smith, "were too unequivocal to be mistaken. A violent pain in the head was one of the

From the frequency of affections of the brain in febrile disorders, Dr. Clutterbuck was led to consider inflammation of this organ as the proximate cause of fever. It requires, however, but a very slight observation to show the falacy of this opinion; and Dr. Clutterbuck, by careful examination, might have found, that other viscera of the body are as frequently inflamed in fever as the brain itself. It often happens that these inflammations supervene and exist, yet in a degree so much below acute and idiopathic inflammation, as scarcely to be productive of pain or uneasiness; and it is only from examinations after death and from the consequences of fever that we are assured of the fact. Thus, an incipient inflammation of the liver, commenced during the presence of the fever, but which, perhaps, excited no attention at the time, continues after an incomplete recovery from the febrile symptoms, and goes on increasing till it sometimes ends in suppuration.

Suppression of urine sometimes occurred; and, generally speaking, unless this secretion was promoted by the use of diuretics it was small in quantity, thick and high colored, and sometimes turbid. I have known the suppression in fatal cases to continue nearly two days, without being accompanied by any pain. Though a copious secretion of urine or a kindly perspiration was a favorable symptom, it often happened, that the paroxysms subsided, and convalescence was finally established without any marked crisis of either of these secretions: yet in such cases the bowels became free and soluble, easily operated on by laxatives, and the morbid matter seemed to be evacuated by stool.

Sweats were common at the subsidence of the first or second paroxysm; after this, in violent cases, the skin became dry and constricted. Nor were sweats of any service when forcibly excited by stimulating means during the continuance of the fever. This circumstance is worthy of consideration; and I am clearly of opinion that much injury was done in the disease by the injudicious use of hot snake root tea, in cases of considerable excitement of the blood vessels, with the view of producing sweat. On several occasions I found it necessary to moderate and suppress this excretion, as much as possible, on account of its debilitating effects. I have known it, for hours, to pour like rain drops

earliest, most constant, and most distressing symptoms of this disease. Coma was a very frequent symptom; and, as I thought, in proportion to the severity of the disorder. Towards the close it amounted almost to total stupefaction; it being scarcely possible to rouse the patient."
Webster's Collection of Papers on Bilious Fevers, p. 117.

from the patient's body. When thus excessive, so far from being serviceable, it was, more especially, in the advanced stage of the disease, a dangerous and alarming symptom, as indicating a degree of atony and relaxation of the exhalents, the very reverse of healthful or salutary perspiration. These sweats were often accompanied with a coldness of the surface and extremities; and when occuring late in the complaint might be considered as affording an unfavorable prognosis. They sometimes appeared at an earlier period, during the subsidence of the paroxysm, more especially if active medicines, such as emetics or cathartics, had been employed in the exacerbation. Cases of this description were not dangerous; and provided stimulating remedies were employed in time, and duly persisted in, the patients generally recovered. I have known such sweats to continue for hours, with a coldness of the surface and extremeties, and without any pulsation of the artery at the wrist, and yet the patient recovered: Such recoveries, however, only took place where the prostration occurred in the early stage of the disease. Sometimes the skin, from being dry and parched, became suddenly covered with a copious exundation of sweat, wetting, like rain, the bed clothes and body linen of the patient. If together with these sweats there was coma or derangement of intellect, great danger was to be apprehended.

The appearance of the tongue in this disease was various in different patients during the same part of the season, and a difference was also observable in different periods of the epidemic. At the commencement of this complaint, the tongue was moist, and generally more or less covered with a white fur. From white or yellowish it became dark towards the close of the complaint, whether the disease terminated in death or convalescence. It was not unusual for the tongue, which for the first four or five days had been covered with a glutinous pellicle, to become quite clean at a later period, and continue so till the termination of the disorder. Sometimes this furry substance would reappear in different stages of the disease. In some patients the tongue was red, clean, smooth, dry crisp & of glassy smoothness, the papillæ being entirely effaced. When the whole surface of the tongue exhibited this appearance the prognosis was unfavorable; when the tip of the tongue only was in this state, and free from that fiery or crimson redness before stated, whilst at the same time the rest of the tongue was moist and clean, or slightly covered with a white fur, less danger was to be apprehended. In fatal cases the tongue

would sometimes become rough, dry, black, horny and furrowed with deep fissures; in others it would continue moist and clean, and sometimes black; or if during the preceding stage of the complaint it had been dry, it would become moist previous to death. Sometimes it was moist and of a crimson redness, the papillæ much enlarged, and the posterior part of the tongue covered with a greenish or yellowish fur. In some cases the tongue was whiteish and sodden, as if parboiled, the fur being very short, giving to the surface beneath a bluish cast. In the latter part of the season when the symptoms became more inflammatory, the tongue was generally cleaner than it had been at the commencement of the epidemic: and it was not unusual for very inflammatory symptoms to prevail, and such as required the repeated use of the lancet, though at the same time the tongue presented an appearance perfectly healthy. Nor could any correct opinion be formed as to the propriety or impropriety of exhibiting emetics, from the cleanness or foulness of the tongue. In some, the tongue presented a whitish appearance, and trembled when protrudud from the mouth. In others it was smooth, red and shining. A tongue free from fur, but at the same time covered with a slimy mucus was unfavorable, as indicating a strong tendency to asthenia. A tongue clean and of a healthy appearance, when the other symptoms were unfavorable, afforded a dangerous prognosis. In the advanced stage of the complaint the patients sometimes complained of numbness of the arms, legs or thighs.

Dropsical swellings of the extremeties were a common consequence of fever. In some cases these threatened the invasion of a general dropsy; not being confined solely to the feet and legs, but extending over the whole surface of the body, the abdomen at the same time being considerably tumid. Sometimes this dropsical effusion was coincident with the febrile affection, appearing evidently to depend upon an increased action of the sanguiferous system; the swelling increasing with every exacerbation, and again diminishing with the remission of the fever. That those swellings were in some degree connected with a relaxed and debilitated state of the exhalent arteries appears reasonable; yet there were many cases of extreme debility where these dropsical effusions never made their appearance: and in general, though not always, they were more liable to happen during the state of convalescence, than towards the decline, or soon after the cessation of the fever. Perhaps the circumstance may be accounted for in this way, that the larger arteries

recovering their healthy tone and energy sooner than the anastomosing branches and exhalents, acted with a degree of strength and vigor disproportionate to the exhausted condition of the minute vessels. However this may be, these affections were not generally serious in their consequences; but yielded without much difficulty to the appropriate remedies.

Several persons lost a considerable portion of the hair of their heads, as the consequence of fever.

Neither age nor sex afforded an exemption from this disease. To women in a state of pregnancy it proved unusually malignant, few surviving that were affected by it. In them the inflammatory, and what the older physicians would call the symptoms of putridity, ran higher, and the fever assumed a more continued unremitting and protiform character. Though I saw several I had myself but one patient of the discription; the case for a few days appeared dangerous and doubtful; the disease, however, went through its course in the usual time, and ended in recovery.

Children were also very liable to attacks of the disorder; but in them, though the symptoms often ran high, yet, in general, the fever was less obstinate than in adults, yielding with facility to the remedies employed; and often disappearing entirely upon the exhibition of an emetic and cathartic. In children the fever was marked by some peculiarity: they were generally comatose during the continuance of the febrile excitement; and not unfrequently the intellect, for a time, was entirely destroyed; yet upon the subsidence of the fever this affection of the *sensorium commune* disappeared; the mind again became lucid and composed, and frequently the little patients at the end of the paroxysm would rise from the bed, and pursue with cheerfulness their accustomed amusements. In them also the appetite was less impaired; and I have often seen them eating with avidity, previous to any considerable abatement of the fever. They were likewise more free from pains, anxiety and distress than patients of mature years; the causes which produced great uneasiness and commotion in the latter, appearing to operate with such force upon the more delicate nerves of children as to destroy all consciousness and perception of existing irritation.

The disease was more unfavorable in fat and corpulent persons. We know that fat people, even in health, are more easily evercome with heat and exercise than those of a thin spare habit. This seems to be owing to two causes; first, the adipose covering that invests the body is a bad

conductor of heat; hence the excess of temperature generated by exercise and the increased activity of the circulation is not transmitted with facility to the surface, and carried off by perspiration. It appears to be owing to the circumstance of fat and oil being bad conductors of heat, that warm blooded animals, inhabiting the ocean, as the whale, porpoise, &c. are enabled to maintain their temperature, even under the intense cold of the polar regions. Second, in man this undue accumulation of adipose matter in the celular texture straitens and impedes the freedom of the circulation; in consequence of which the blood is, in a measure, excluded from the surface and accumulated in undue quantity in the interior cavities and viscera of the body; and the lungs, from being gorged with blood, are forced to more frequent and laborious respiration in order to facilitate its passage. Hence fat persons are often subject to apoplexy. In fever we frequently find the pulse of corpulent persons extremely small and feeble; often faultering, and liable to sink upon an aggravation of the febrile cause.

I observed, in several instances, a difficulty in swallowing, not only in cases that terminated fatally, but likewise in those which were finally recovered from. I had previously observed this affection in Florida to denote great danger, though the other symptoms at the time might not seem immediately alarming. In the disease under consideration, however, it by no means attended every case that terminated unfavorably; and it was not uncommon for the patient to swallow with facility whatever was offered him till within a few minutes of his death.

Hiccup was a symptom of frequent occurrence. When it came on at a late period of the disease it indicated danger. I have known it to occur at an earlier stage, and to be very distressing; returning at intervals, upon swallowing any thing which produced an irritation in the stomach. It occurred only, or chiefly in cases of great weakness and irritability of the stomach, in consequence of prostration, and protracted illness; and when supervening in the advanced stage of the disease, there was reason to apprehend an incipient mortification of the stomach and bowels, or a degree of atony and relaxation incompatible with recovery.

In some cases the surface of the body acquired a morbid degree of sensibility; the patients complaining of a sense of soreness when touched or handled without the utmost care and tenderness. Others complained of a numbness of the extremeties, or of some part of the body, commonly confined to one leg, side, or arm,

Many persons were affected with large blotches or whelks on different parts of the body, often without any other symptom of indisposition. These blotches appeared like the risings on the skin produced by the bites of musquetoes, but much larger, and very irregularly circumscribed. They seemed to depend upon the same vitiated state of the fluids that produced the fever itself, and where they appeared without any other symptom of disease, were removed by the operation of a cathartic. Sometimes they appeared as a symptom of fever. Cases of this kind are to be met with every summer, both as an idiopathic complaint, sometimes attended or preceded by some degree of sickness and fever, and at others as symptomatic of the common endemic of the country. Such blotches or eruptions were observed by Dr. E. H. Smith in the yellow or bilious fever of New-York in 1795.

The memory was sometimes impaired in this disorder; and such was the imperfection in the exercise of the intellectual faculties, that patients upon recovering from the fever reflected upon the incidents of their illness as upon the fantastical illusions of the night; the whole of what had passed appearing like a dream imperfectly remembered.

A symptom which I remarked in several of the worst cases, though mostly in such as terminated in recovery, was the strange fancy of the patient's imagining himself to consist of, or to be divided into, two or three distinct persons, placed side by side, in the same bed, and that one person was obliged to endure all the distress, and receive all the medicine, whilst the others lay at their ease, and indulged freely in the luxury of drinking cold water. It was at the same time a subject of pity rather than amusement, to hear the half deranged and dreaming patient, after taking a dose of medicine, to direct a portion to be given to the other side.

As may reasonably be supposed, there was but little or no appetite for nourishment in this disease, and gruel, though recommended and taken to support the strength, and to assist the operation of cathartics, was often unsavory and disgusting. Upon the abatement of the fever solid food was more grateful than fluid. One patient who had not tasted any nourishment for several days, desired, as the first cravings of returning appetite, a piece of broiled ham and salt fish. He followed, in this particular, his own council and the dictates of his feelings. The salt fish and ham agreed with him, he rose from his bed dressed himself and walked to his store; upon returning he again had recourse to this agreeable refreshment, and found himself much better.

From fish and ham his appetite soon acquired its accustomed relish of a more suitable and delicate variety.

During the summer there were but few who did not suffer more or less severely from sickness and indisposition. But there were a number whose illness never confined them to their beds. Some were affected with slight chills and fevers, which were often readily subdued by a single emetic or cathartic; many slight attacks were entirely removed in this manner. There were few, even of those who pursued their ordinary business, that were entirely free from every symptom of disease; generally the tongue was more or less furred; in others there was a preternatural frequency of pulse, an impaired appetite and digestion, flatulency, colic, diarrhœa, catarrh, or some other deviation from perfect health.

Some physicians have strenuously insisted on the specific nature of the yellow fever; yet strange as it may appear, there are scarcely two, that, in describing the disease, agree as to the particular symptoms which constitute its peculiar diagnosis. The truth is that the yellow fever is nothing more than a high grade of the bilious remittent, which as it may be variously modified by a variety of causes, local in their origin, and changeable in their nature; so in the same degree must the symptoms be liable to fluctuation and change: and we accordingly find, that wherever what is called the yellow fever has made its appearance in any of the seaports of the United States, the same fever as an epidemic, though perhaps less malignant in its nature, has prevailed in various parts of the country at the same time. Thus, the bilious remitting fever which prevailed in Cahawba and its vicinity in the summer and autumn of 1821, and which in conformity to the modern nomenclature, with the strictest propriety might be denominated the yellow fever, was likewise generally prevalent, not only throughout the state of Alabama, but throughout the southern states, at the same time. It made its appearance not only in the seaports of Baltimore, Norfolk and Wilmington, but likewise in inland situations remote from any commercial intercourse. In certain situations more favorable than others to the full developement of its malignity, it assumed every formidable symptom of the so much dreaded yellow fever: in others it put on the character of a mild remittent, entirely free from malignity and danger; and in places still more favored it appeared under the aspect of a quotidian or tertian intermittent, or what is commonly called *chills and fevers*. That in all these instances there was a similarity in the origin and

nature of the epidemic, appears to be a matter too evident to admit of contradiction. And in further confirmation of this opinion, I would remark, that, with few exceptions, all who had labored under severe attacks of the bilious fever, were subsequently subject to chills and fevers, or attacks of severe intermittents, some times continuing to recur throughout the winter.

TREATMENT.

Some difference of opinion existed among physicians as to the cure of this disease; and it is admitted that at different periods of the same season, different remedies seemed to be required, from a change in the features and symptoms of the complaint. Thus, at an early stage of this disorder as an epidemic, the symptoms were less inflammatory and malignant than they were later in the season; so that the means which were found the most beneficial in one instance were not so well adapted in the other.

Blood-letting.—Perhaps there was no means or remedy employed in this disease on which the opinion of physicians was so much divided as on this: though I believe it was generally remarked, that those who were the most violent in condemning it were those, who, from want of personal experience, were ignorant of its effects. It is true, that at the commencement of the sickly season, blood-letting was not so necessary as at a subsequent period: and, perhaps, there were but few at this time who absolutely required it: at least, as far as my own experience was concerned, the disease, at the commencement of the season, yielded without much difficulty to other remedies. The disorder afterwards, however, as has already been stated, became more inflammatory, with a great disposition to congestion, inflammation and derangement of the brain, lungs, stomach, bowels, liver, spleen, &c. To diminish the violent excitement of the heart and arteries, and to take off the tendency to local inflammations, venesection, in many cases, seemed to be absolutely required. Dr. Casey, an experienced and judicious physician of this place, as well as myself, can bear testimony to the importance of blood-letting in the treatment of this disease. The most proper time for the employment of this remedy, was during the exacerbation of the fever, when the body was preternaturally hot, and the pulse full, strong and tense. The frequency or slowness of the pulse had less influence in governing the practice than its hardness and tension. I have known the pulse to indicate high excitement and considerable inflammation, with little or no preternatural increase of frequency; but

the artery, in these cases, was hard, tense and resisting to the touch; and when pressed against the tendons and ligaments of the wrist, communicated a peculiar vibrating sensation to the fingers, like sand or gravel hurried along in the course of the circulation. Here blood-letting was immediately and copiously called for. In the employment of this remedy, it was necessary to be governed more by the effects produced than by the quantity drawn; and it often happened that a tea-cupful of blood taken away at the commencement of the disease had a greater effect than four times the quantity at a subsequent period. I have known the abstraction of four ounces of blood at the commencement of the fever, when performed in the horizontal position of the patient, to produce so much sickness and langor as to render it necessary to stop the operation: notwithstanding the pulse, before the venesection, was frequent, strong and hard, the abstraction of this small quantity had the effect of rendering it much softer, and of reducing the morbid heat of the body to the natural temperature. In the course of a few hours after the first bleeding, it was not uncommon for the fever to rise considerably higher than it was at the first; the body would become excessively hot and dry, the pulse frequent and tense, and often accompanied with a violent palpitation of the heart. Here blood-letting was again called for, and in more copious quantity than at first. Under these circumstances I have sometimes taken away a quart of blood at a single operation, and with the best result.

The effects of blood-letting were to subdue or moderate pain, soften the pulse, stop the palpitation of the heart, reduce the excessive heat of the body, remove the stricture of the surface, thereby opening the pores of the skin and producing perspiration; from restlessness and anxiety, the patient was restored to ease and composure; the oppression of the brain was in a greater or less degree removed; the coma, morbid drowsiness and stupidity were relieved, and every symptom improved.

I know it is a prevalent opinion among physicians that bleeding in warm climates and sickly seasons should be employed, or ventured upon, with the greatest caution. It is not in every epidemic, nor at every period of the same season, that blood-letting is alike necessary and proper; and in forming an opinion upon this subject, we are to be guided in our practice, by the circumstances already pointed out in the general treatment of endemic fever. When the epidemic is of a malignant character, when the disease is ad-

vanced, when the pulse is destitute of strength, and when there are no indications of local inflammation or congestion, every prudent physician, under these circumstances, would hesitate in the employment of the lancet. But where the pulse is strong and tense, as it was during a considerable part of the epidemic under consideration, there is probably no remedy that we can employ with equal efficacy, advantage and success. In the yellow or bilious fever which prevailed in Philadelphia in 1793 and 1794, the pulse, as well as most of the other symptoms, was the same as that observed in the patients affected with the bilious fever in this place in the summer and autumn of 1821. And it is well known to what an extent Dr. Rush pursued the practice of blood-letting in the fever of Philadelphia. His success, if we may judge from his own statement, as well as from the concurring testimony of others was astonishing and unequalled.* On the contrary in the year 1780, owing to the circumstance of the fever being less inflammatory, the same author informs us that blood-letting was followed by pernicious consequences. His words are as follows, "Out of several hundred patients whom I visited in this fever, I did not meet with a single case, before the 27th of September in which the state of the pulse indicated this evacuation. It was true, the pulse was *full*, but never *hard*. I acknowledge I had been called to several patients who had been bled without the advice of a physician, who recovered afterwards on the usual days of the solution of the fever. This only can be ascribed to that disposition which Dr. Cleghorn attributes to fevers to preserve their types under every variety of treatment as well as constitution. But I am bound to declare further, that I heard of several cases in which bleeding was followed by a fatal termination of the disease."† Dr. Rush seldom ordered more than ten ounces of blood to be extracted at a single bleeding; but he often repeated the operation two or three times a day; and from several of his patients in the bilious fever of 1794 he extracted 150 ounces of blood in the course of the disease. He lays considerable stress upon this method of blood-letting, in preference to more sudden and copious depletion. The doctor illustrates this practice of small bleedings by a reference to the disease in South-Carolina, known by the name of the *pleurisy in the head*, which occurs in the winter after a sickly autumn, and seems to be an evanescent symp-

* Med. Inq. & Obs. Phil. ed. 1809, Vol. 3.
† Med. Inq. & Obs. Vol. 2, p. 399.

tom of the bilious remitting fever. Bleeding we are informed was employed in its treatment in the common way, and without success; though the remedy succeeded in another mode, and that was by obtaining the discharge of a few ounces of blood from the nose by thrusting a piece of quill up the nostrils. Riverius describes a pestilential fever, which prevailed at Mont-Pellier, in the year 1623, which carried off one half of all who were affected by it; this judicious physician prescribed the loss of two or three ounces of blood. The pulse rose, he informs us, with this small evacuation. Three or four hours afterwards he drew six ounces of blood from his patient, and with the same good effect. The next day he gave a purge, which he says rescued his patients from the grave. All whom he treated in this manner recovered. "The whole history of the epidemic," says Dr. Rush, who quotes the above passage, "is highly interesting, from its analogy with our late epidemic (of 1793) in so many of its symptoms, more especially as they appeared in the different states of the pulse."* And from my own experience, I can say, that small bleedings only or chiefly were admissible in the first stages of the bilious fever of this place in 1821. At a subsequent period of the disease, however, I often found large evacuations necessary; and on these occasions I have taken away 20 or 30 ounces of blood at a time, before any very sensible alteration could be made in the pulse. The effects of blood letting upon the heart and arteries varied in different patients. When the pulse was very frequent before the bleeding, it became slower after the operation; when there was little or no preternatural frequency previous to venesection, it became somewhat accelerated subsequent to the loss of blood. But in every case the tension or hardness was more or less removed, and the febrile heat as well as the pains which affected different parts of the body diminished, and a remission commonly followed in a short time. I have sometimes had recourse to the employment of this remedy as late as the second week, from the commencement of the disease, and with the best effect. Bleeding was as serviceable, we are informed by Dr. E. H. Smith, in the yellow fever of New-York in 1795, on the 5th and 6th days, as on the first; but that this necessity for its use at so late a period, did not often occur where it had been vigorously employed in connexion with the other remedies at first.†

* Inq. and Obs. Phil. Ed. 1809. Vol. 3, p. 275.

† Websters's collection of papers on bilious fevers, p. 131.

In cases where blood-letting was not required, I commenced the cure by the exhibition of an emetic. This, in ordinary cases, consisted of tartarised antimony. My method of giving it was to dissolve from six to ten grains of this medicine in about half a pint of warm water, directing the patient to take about one-fourth of this mixture at the first draught, and should this not prove sufficient, in the course of fifteen or twenty minutes to repeat it, in the quantity of a table spoonful every ten minutes, till it produced five or six operations by vomiting. Given in this way it commonly acted both as an emetic and cathartic. During its operation as an emetic the patient was directed to drink copiously of warm water, and when it acted upon the bowels to take freely, from time to time, of thin gruel or toast water: which answered a double purpose as assisting the operation of the medicine, and supporting in some degree, the strength of the patient. Though emetics were highly serviceable in this disease, some caution was necessary in their employment; for where a considerable dose of tartar emetic had been taken and it produced little or no operation as an emetic, it was liable to act as an excessive and violent cathartic: in which cases I have known an alarming prostration to ensue as the consequence. This sudden prostration, which I have previously noticed when treating of the symptoms of this disease, not unfrequently happened even from the exhibition of emetics in ordinary doses; but when occuring at an early stage of the disease, I never found much difficulty in removing it by the timely application of stimulating remedies; such as warm brandy toddy, wine sangre, and hot applications to the extremities. Though the stomach was sometimes operated upon with difficulty by emetics, yet it sometimes happened that a single spoonful of the solution of tartar emetic, previously mentioned, was sufficient to excite a free and copious vomiting. This seemed to be owing to the quantity of bile and vitiated fluids in the primæ viæ oppressing and nauseating the stomach, and which, therefore, required but little to excite it into action. The quantities of green and yellow bile discharged in this way were sometimes immense and astonishing. Making allowance for the drink taken in, I think I shall speak within bounds when I say that I have seen nearly half a gallon of green, ropy, bitter nauseous fluid discharged from the stomach by the operation of a single emetic. From this we may judge of the necessity and importance of this remedy in this disease: for cathartics, however drastic, were not equally effectual in emulging and unload-

ing the hepatic system, and thereby promoting the expulsion of the stagnating vitiated fluids. Provided the emetic operated well I did not generally repeat it at any subsequent period. Sometimes, however, such a repetition was indicated by the sickness and oppression of the stomach, bitter taste and foul tongue ; under these circumstances emetics were again had recourse to with advantage. Even in the latter stage of this disease, when the person complained of an increased nausea of the stomach, I sometimes prescribed this remedy with relief and benefit to the patient; it generally brought away more or less of a bright green colored matter, of a flaky appearance ; which was thrown up with but little effort of vomiting, and appeared to have been floating among the contents of the stomach. The discharge of this poisonous looking stuff always afforded considerable relief. In the employment of emetics it was necessary to attend to the cautions already pointed out, under the general treatment of fever, pages 311 and 312. Ipecac. or the sulphate of zinc was safer in the advanced stage of the disease.

After the operation of the emetic, a cathartic was exhibited. In many cases, however, it was necessary to defer the purgative a few hours after the emetic had ceased to operate, otherwise the system might be too much debilitated by the operation of the two remedies in immediate succession: but upon this subject I have given particular directions under the general treatment of fever. As there is a constant reproduction of bile in this disease, the accumulation of which is known to aggravate the complaint, the necessity of employing cathartics must be sufficiently manifest : and as the bowels are liable to be very much constipated in bilious disorders, it is necessary that the purgatives employed should be of the most active kind, in order to ensure their effects, this at least was necessary in the disease under consideration. In the treatment of the bilious remitting fever of Philadelphia in 1796, Dr. Rush, next to bleeding, placed his principal dependence in purgative medicines. The disease at that time was new to him, and his first attempts to stop its ravages were fruitless and unavailing. As the circumstances which led to his subsequent practice are interesting and instructive, I will here quote them for the benefit of the reader. "Baffled in every attempt to stop the ravages of this fever, I anticipated all the numerous and complicated distresses in the city, which pestilential diseases have so often produced in other countries. The fever had a malignity and obstinacy which I had never before observ-

ed in any disease, and it spread with a rapidity and mortality far beyond what it did in the year 1762. Heaven alone bore witness to the anguish of my soul in this awful situation. But I did not abandon a hope that the disease might yet be cured. I had long believed that good was commensurate with evil, and that there does not exist a disease for which the goodness of Providence has not provided a remedy. Under the impression of this belief I applied myself with fresh ardor to the investigation of the disease before me. I ransacked my library, and pored over every book that treated of the yellow fever. The result of my researches for a while was fruitless. The accounts of the symptoms and cure of this disease by the authors I consulted were contradictory, and none of them appeared altogether applicable to the prevailing epidemic. Before I desisted from the inquiry to which I had devoted myself, I recollected that I had, among some old papers, a manuscript account of the yellow fever as it prevailed in Virginia in the year 1741, which had been put into my hands by Dr. Franklin, a short time before his death. I had read it formerly, and made extracts from it into my lectures upon that disease. I now read it a second time. I paused upon every sentence; even words in some places arrested and fixed my attention. In reading the history of the method of cure I was much struck with the following passages.

"It must be remarked, that this evacuation (meaning by purges) is more necessary in this than in most other fevers. The abdominal viscera are the parts principally affected in this disease, but by this timely evacuation their feculent corruptible contents are discharged, before they corrupt and produce any ill effects, and their various emunctories and secerning vessels are set open, so as to allow a free discharge of their contents, and consequently a security to the parts themselves, during the course of the disease. By this evacuation the very minera of the disease, proceeding from the putrid miasmata fermenting with the salivary, bilious, and other inquiline humours of the body, is sometimes eradicated by timely emptying the abdominal viscera, on which it first fixes, after which a gentle sweat does as it were nip it in its bud. Where the primæ viæ, but especially the stomach, is loaded with an offensive matter, or contracted and convulsed with the irritation of its stimulus, there is no procuring a laudable sweat till that is removed; after which a necessary quantity breaks *out of its own accord*, these parts promoting it when by an absterging medicine they are eased of the burden or stimilus which oppresses them."

"All these acute putrid fevers ever require some evacuation to bring them to a perfect crisis and solution, and that even by stools, which must be promoted by art, where nature does not do the business herself. On this account an *ill-timed scrupulousness about the weakness of the body* is of bad consequence in these urging circumstances; for it is that which seems chiefly to make evacuations necessary, which nature ever attempts, after the humours are fit to be expelled, but is not able to accomplish for the most part in the disease; and I can affirm that I have given a purge in this case, when *the pulse has been so low that it could hardly be felt*, and the *debility extreme*, yet *both one and the other*, have been *restored by it*."

"This evacuation must be procured by *lenitive chologoque* purges."

"Here I paused," says Dr. Rush. "A new train of ideas suddenly broke in upon my mind. I believed the weak and low pulse which I had observed in this fever, to be the effect of debility from a depressed state of the system, but the unsuccessful issue of purging, and even of a spontaneous diarrhœa, in a patient of Dr. Hutchinson, had led me not only to doubt of, but to dread its effects. My fears from this evacuation were confirmed by the communication I had received from Dr. Stevens. I had been accustomed to raising a weak and low pulse in pneumony and apoplexy, by means of blood-letting, but I had attended less to the effects of purging in producing this change in the pulse. Dr. Mitchell in a moment dissipated my ignorance and fears on this subject. I adopted his theory and practice, and resolved to follow them. It remained now only to fix upon a suitable purge to answer the purpose of discharging the contents of the bowels. I have before described the state of the bile in the gall-bladder and duodenum, in an extract from the history of a dissection made by Dr. Mitchell. I suspected that my want of success in discharging this bile, in several of the cases in which I attempted the cure by purging, was owing to the feebleness of my purges.

"Finding ten grains of jalap insufficient to carry the calomel through the bowels in the rapid manner I wished, I added fifteen grains of the former to ten of the latter; but even this dose was slow and uncertain in its operation. I then issued three doses, each consisting of fifteen grains of jalap and ten of calomel; one to be given every six hours until they procured four or five large evacuations. The effects of this powder not only answered, but far exceeded my expectations. It perfectly cured four out of the first

five patients to whom I gave it, notwithstanding some of them were advanced several days in the disease.

"There is, in all bilious fevers, a reproduction of morbid bile as fast as it is discharged. I therefore gave a purge every day while the fever continued. I used castor oil, salts, cremor tartar, and rhubarb (after the mercurial purges had performed their office), according to the inclinations of my patients, in all those cases where the bowels were easily moved; but where this was not the case, I gave a single dose of calomel and jalap every day. Strong as this purge may be supposed to be, it was often ineffectual; more especially after the 20th of September, when the bowels became more obstinately constipated. To supply the place of the jalap, I now added gamboge to the calomel. Two grains and a half of each, made into a pill, were given to an adult every six hours, until they procured four or five stools."

The views of Dr. Rush in relation to the bilious fever of Philadelphia I conceive to be perfectly applicable to the disease under consideration; and as his name stands deservedly high in his profession, his authority may be more respected than that of an individual less known. Obstinate constipation of the bowels was not peculiar to the fever of Philadelphia, the same thing takes place to a greater or less degree in all bilious epidemics, and was particularly remarkable in the bilious fever of this place in 1821. Such, frequently, was the degree of constipation in this disease, that it was with the greatest difficulty medicine could be made to act upon the bowels, though assisted in its operations by the frequent use of enemata. Fifteen grains of calomel with twenty-five of jalap might, in general be considered as a moderate dose; and this, or some other cathartic, often required to be repeated together with injections before an evacuation could be procured. Jalap and cream of tartar was generally as certian and efficacious as a cathartic.

I commonly gave calomel pretty freely in the early stage of this disease, both to render the bowels soluble, and to remove obstructions. These objects were materially promoted by the exhibition of this medicine. I have known salts and castor oil, by themselves to go through the bowels without occasioning any thing more than a thin watery discharge; but in such cases the addition of calomel to some active cathartic produced copious, feculent and bilious evacuations. The repeated exhibition of calomel for the purpose of keeping up the action of the bowels sometimes occasioned soreness of the gums; and when this was at the same time attended with a soft and moist skin, it was a favorable symp-

tom. In general, I found the disease to yield more readily after the gums became affected by mercury; though on some occasions, I have, I think, observed a contrary effect; but the latter only or chiefly happened when the skin was dry, parched and hard, and never moistened by the appearance of sweat. In such cases the pulse would continue frequent, tense, and wiery, and the throat become dry, parched and painful. Though the gums were swelled and inflamed, the patient was not inclined to spit, but on the contrary complained of constant dryness of the mouth and throat. I never intentionally pushed the exhibition of calomel to the point of salivation, though I often gave it in sufficient quantity to produce a degree of redness and swelling in the gums. But where there was much debility or danger of prostration I deemed it proper to avoid the use of calomel altogether.

A great point in the treatment of bilious fever is to keep the bowels thoroughly cleansed, and free from all accumulations of bilious, excrementitious, and offensive matters which are incessantly poured into them, and therefore require to be constantly removed by the exhibition of the appropriate remedies, such as cathartics and injections. Where the mouth was affected from the exhibition of calomel purges, glauber or epsom salts were exhibited, as occasion required. As it frequently happened that great irritability of the stomach existed, which rendered it almost impossible to retain any bulky medicines, we were obliged to have recourse to those which were least offensive. On this account, Epsom and Rochelle salts, or the phosphate of soda were found to agree better than Glauber's salts: and to prevent their being rejected, they were given in small doses, frequently repeated, say every hour, or half hour, until a sufficient quantity had been taken to operate freely, two, three, or four times. Another thing was necessary to be kept in view, which was, not to put off the exhibition of purgatives till the time that they were absolutely required. If their exhibition was delayed under the expectation that nature, unassisted, would bring about an evacuation, the patient would suffer before the cathartic could be brought to act upon the bowels. It was, therefore, necessary to anticipate the time when the urgency of the symptoms might require the evacuations of the intestines without delay, by beginning with salts or other purgatives from four to six hours before hand. Some patients rejected medicine in any form except that of pill; and as medicine in this form operates slowly, the more was required. In such cases, I have sometimes

been obliged to direct the administration of as many as thirty pills of calomel and jalap, before any operation was procured; directing two or three to be taken every ten or fifteen minutes, till the necessary quantity had been received.

Injections were found to be of essential benefit. They could at any time be employed in cases of emergency; and where restlessness prevailed, together with fever, and heat and pain in the bowels, their operation was followed by the most salutary and composing effect. This shows how much an irritation in the bowels extends itself to the whole nervous system. These injections commonly brought away a considerable quantity of bilious and feculent matters. When an exacerbation of the fever came on, injections almost always produced a mitigation of the symptoms; they likewise assisted the operation of cathartics taken by the mouth.—Where much debility and prostration existed, prohibiting the use of cathartic medicines, injections became indispensably necessary. Where considerable constipation prevailed and the patient was debilitated, injections were frequently repeated. This remedy was on some occasions employed with another view than that of removing costiveness; it sometimes happened that the fever rose with violent pain and distress in the stomach and bowels; nothing removed this symptom so soon and so effectually as an injection of warm water with a tea-spoonful or two of laudanum; suffering it to remain a few minutes, and then bringing it away by a simple enema of warm water. When it was immediately returned, it became necessary to repeat the exhibition of laudanum. Opium exhibited in this way was entirely free from danger, as we had it completely at command: and on some occasions of great pain and irritation, in which bleeding had proved unavailing, I found it necessary to exhibit two ounces of the tincture before the distress and griping could be materially relieved.

The Cold Bath.—Cold bathing in the cure of fever is a means on which much diversity of opinion has existed, nor are the physicians of the present day entirely agreed as to the utility of its employment. In this country it has never come into general use: and I believe there are but very few places in the United States where it is considered and employed as a medical prescription. This may be accounted for from the influence of prejudice and want of experience amongst some, and from its employment under improper circumstances amongst others. It is possible and even probable that in some epidemics, cold bathing may afford but little benefit, or, indeed prove prejudicial; such at least

would be our conclusion were we to believe the accounts of several physicians who have written on the subject: and even in the course of my own practice, I have found that cold bathing is much less serviceable in the fevers of some seasons than it is in those of others. The weight of evidence, however, among physicians who have written on the diseases of hot and tropical climates is in favor of cold bathing as a general remedy. Certain it is that in the epidemic which prevailed in Cahawba and its vicinity in the summer and autumn of 1821, I saw in many instances, the most happy effects from the employment of the cold bath. In the use of this remedy it was necessary that several circumstances should be attended to. To authorise its use there must be a preternatural increase of heat upon the surface of the body; and the higher the temperature the more decidedly serviceable did it prove. The manner in which I employed it has been already mentioned under the general treatment of fever. When upon coming from the bath the person was laid in bed, as the temperature rose a free perspiration would frequently break out, to the great relief and benefit of the patient. Not unfrequently, however, the heat of the body would return in a short time without the appearance of a perspiration; in such cases a repetition of the remedy became necessary. It was scarcely ever necessary to repeat the cold bath more than two or three times during the same paroxysm.

The effect of this remedy was to diminish the heat of the body—relieve the pain in the head—stop the palpitation of the heart—moderate the frequency of the pulse, and render it more soft and natural—and to impart ease and comfort to the general system.

It is a false and erroneous idea to suppose that cold bathing puts an immediate termination to the febrile paroxysm. The most it does is to produce a mitigation of the symptoms, and to cause that change in the vascular and nervous systems favorable to the solution of the fever. It is certain that the cold bath has the power and effect of completely subduing the fever for a time, but I never saw an instance of its employment in which the fever did not rise, more or less, in a few minutes afterwards, and go through its usual stages. These observations are made in contradiction to the erroneous statements and unfounded speculations of Gianini,* that in intermittent fever, for the same remedy applies to the intermitting and remitting fevers, in both of

* See Chapman's Philda. Med. & Phys. Jour. vol. ii, p. 113.

which I have employed it with equal advantage, that in this disease the cold bath *produces not a partial alleviation of symptoms but an entire solution of the disease*, than which nothing is more unfounded and foreign to the fact.

When the fever was protracted and obstinate, receiving but little benefit from the other remedies employed, the superior utility of the cold bath was then apparent, in frequently bringing about a remission and establishing a state of convalescence. Where the skin was unusually dry, with but partial or no appearance of perspiration, though the heat was but little increased above the natural standard, cold bathing was resorted to with evident advantage. In those cases of typhus or nervous fever which supervene upon obstinate and malignant attacks of bilious fever, and in which the paroxysms were irregular and erratic, returning at no particular period, and where the remissions themselves were obscure and scarcely perceptible, the fever rising and declining frequently through the day, in such cases the cold bath was employed with considerable benefit.

Where the patient was too much debilitated to bear the shock of the cold affusion, warm water was substituted in its place; or, in lieu of both, the body was sponged with warm vinegar, or diluted muriatic acid. The latter remedy possessed considerable power.

The Warm Bath.—Warm bathing was also sometimes advantageously employed, but the instances were comparatively few in which its employment was necessary and proper. Where there was considerable debility, with unequal distribution of temperature, the feet being cold and the body warm, or where the warmth of the general surface was below the natural standard, warm bathing was sometimes employed with advantage, care being taken not to exhaust the strength too much by too long a continuance in the water.

Where the fever and heat were not so high and uniformly diffused as to require or admit the use of the cold bath, relief was obtained by the topical applications of linen clothes, wet with cold vinegar and water, to the forehead, breast and extremeties, either at the same time, or as an unequal degree of heat in any of these parts might render necessary. The patient expressed great relief from these applications, and their expediency was indicated by the excessive heat which was apt to prevail in particular parts of the body. Cold applications to the head, such as snow, ice, cold water and the claycap, are old and established remedies in phrenitis and mania; and as there can be no doubt that the brain in cases of original and idiopathic fever is fre-

quently affected with a degree of inflammation, the same practice is sanctioned in this disease, both by theory and experience. Whenever, therefore, the head was much affected linen clothes wet with the coldest water and frequently renewed were applied until those symptoms were relieved.

With the same view of relieving the congestion and inflammation of the brain, as indicated by pain in the head, redness of the eyes, derangement and alienation of mind, a blister was applied to the forehead, the temples, or the nape of the neck. I have known patients who had remained stupid, lethargic and senseless for forty-eight hours in the bilious fever of 1821, to awake and recover the use of their intellect upon the drawing of a blister plaster applied to the head.

Having dwelt pretty fully on the treatment of fever under the general head, it will not be necessary here to go into a particular detail and repetition of what has been already discussed; I shall, therefore, conclude by a few remarks upon such other remedies as were found particularly serviceable in the epidemic under consideration.

As a febrifuge, cream of tartar and spirits of nitre, were given with advantage. As a common beverage the quantity of a tea spoon of cream of tartar might be taken dissolved in half a pint of water every two hours. When the patient was in a perspiration it was better to dissolve it in some warm herb tea, as more favorable to the process.

The effervescing, draught of carbonate of potash, or soda and lime juice, or strong vinegar, was likewise a valuable febrifuge and diaphoretic: the latter was often given alternately with the medicine mentioned in the foregoing paragraph.

Sometimes the febrifuge powders described under the general treatment were exhibited.

In addition to the ordinary febrifuge remedies the daily use of purgatives was necessary, during the continuance of the fever; proportioning their strength, quantity and quality to the violence of the fever, and to the strength or debility of the patient. It sometimes unfortunately happened that the debility was so great as to forbid the employment of laxatives in any form; the only thing that could be done towards cleansing the first passages, in such cases, was the use of injections. Cases of this description were often desperate: on the one hand the foul state of the stomach and bowels indicated the necessity of free and copious evacuations; and on the other, we were thwarted in our object by the existing debility of the patient; by careful management

life might be lengthened out and perhaps recovery established, when by a single purgative the patient might be irrecoverably sunk.

Where the fever was inconsiderable and disposed to assume the low nervous or typhoid character, with a dry skin, spirits of nitre and ammonia, or the spiritus mindereri and hartshorn, were employed with advantage; of the former, two parts of spirits of nitre and one of ammonia, a tea spoon full was given every hour or two hours as occasion required. As laxatives cream of tartar, tamarinds, senna and manna, epsom salts, and castor oil were severally given, varied according to the symptoms and the fancy of the patient.

As a constant drink lemonade was more agreeable and useful than any other; tamarind water was also given as a febrifuge, and as a grateful and refreshing drink.

Where the fever was slight, snake root tea was given with a view of promoting perspiration; it was, however, carefully avoided in cases of excitement, as forced sweats were always injurious. And here I would remark a frequent error of patients and attendants. Having ascertained that perspiration is a very desirable object with the physician, they erringly suppose that by whatever means this is effected, the end and object are accomplished; than which no notion can be more erroneous. I have often had occasion to correct this error upon visiting my patients, finding them sweating under a load of bed clothes and the use of hot snake root tea, either from the persuasion and advice of some officious friend and attendant, or from their own notions and skill in therapeutics. At other times I have visited patients in the heat of summer, and found them with a frequent, soft, and weak pulse, much alarmed,and complaining of profuse cold sweats, under a load of three or four blankets; not aware that the sweat proceeded from the quantity of bed clothes, they would scarcely be persuaded of the fact, till the covering being reduced to a single sheet or blanket, these cold, profuse and unnatural sweats disappeared, and the pulse becoming reduced in frequency, rose in strength and fulness. Unskilful treatment is worse than none; and many lives have been lost by injudicious management, which if they had been left to themselves would have been preserved.

The spirits of nitre alone was often a valuable medicine, both as a diuretic and diaphoretic. It sometimes happened in this disease that the urine was small in quantity, high colored and acrimonious, to remedy which acid dil-

ents and spirits of nitre were important and useful remedies. Their utility was rendered the more manifest by the aggravation of the symptoms upon their discontinuance.

Having dwelt at length upon the use of acids, both of the mineral and vegetable kingdoms, under the head of the general treatment of endemic fever, I shall have occasion to say but little here. The nitric, muriatic and vegetable acids were often given in malignant cases with much benefit and success. The mineral acids were sometimes inadmissable from their proving disagreeable to the patient and occasioning sickness and vomiting, unless so much diluted as to render them of little advantage.

As it respects nourishment, during the recess or remission of the fever, the patient's strength was supported by some light food, such as gruel, panada, arrow root, sago, jelly, ripe and preserved fruit, biscuit, toast, and vegetables of easy digestion; any of which might be taken in moderation, and varied according to the inclination of the patient. When the fever receded entirely, more nourishing articles were permitted, and of these soft boiled eggs were as agreeable and wholesome as any.

Temperance and caution in eating cannot be too often and forcibly impressed upon the patient. Indulgence of appetite is the besetting sin of invalids and convalescents; to guard against which they should consider it as a moral and religious duty. Temperance is the guardian handmaid of health; and although drunkenness is deservedly looked upon with digust and contempt, yet the luxurious feeder, who rises from the table with an oppressive load, scarcely considers his indulgence as a crime.

Most of those who had labored under bilious fever were subsequently affected with the intermitting or remitting fevers, of irregular types—rarely assuming the features of a distinct tertian; and both in severity and character there was every variety, from the slightest chill and fever to the most inveterate ague. Some patients were regularly attacked every day about the same hour with a slight chill, succeeded by a fever of different duration in different persons. For the cure of these secondary and irregular attacks the same remedies were required as for the original cases of fever and ague; of these bark was the principle. The returns of chills and fevers were prevented by opiates and warm teas, in the manner already pointed out.

Several West India writers have extolled the efficacy of travelling and the exercise of a carriage in the cool of the day, and under the covert of a shady wood, as of singular

efficacy in the cure of the fevers of tropical climates. To this I would remark that the same means, are often productive of very different results; and as it regards my own experience I can bear testimony to the injurious and sometimes fatal consequences of travelling even for a short distance, and in the most easy mode of conveyance, while the patient is labouring under a fever, or is in a state of much debility and exhaustion: and the friends of Mr. Perkins will long have occasion to lament his imprudence in leaving his chamber in the first stage of convalescense, from a severe attack of bilious fever, and attempting to go home: his slender remains of strength became exhausted after riding a mile and a half in a carriage; and the lapse of a few days put a period to the life of this worthy, respected, and amiable young man.

AN ACCOUNT

OF THE

BILIOUS REMITTING OR ENDEMIC FEVER,

AS IT APPEARED

IN CAHAWBA AND ITS VICINITY,

IN THE

Summer and Autumn of 1822.

Early in the spring, we were visited by the measles, which, in general, however, were not of a malignant kind. The effervescence or eruption was a general diffused redness over the whole surface of the body; and sometimes cough, hoarseness, coriza and inflammation of the eyes took place a week before the eruption made its appearance. Just before the eruption, the symptoms became now severe, attended with a pain in some part of the chest, often in the side, and a cough, in so much, that at this stage it was difficult to distinguish the disease from an attack of plurisy, which prevailed at the same time in persons who had previously passed through the measles, and which seemed to be owing to the same state of the atmosphere that gave rise to the former complaint.

The measles was not confined to children alone, but attacked several persons of mature age.

In the treatment of this complaint, bleeding was sometimes required, more especially in adults, and when pleuritic and inflammatory symptoms existed in a considerable degree. Emetics and laxatives were also serviceable; tartarised antimony, calomel and castor oil, were employed. In some, the application of blistering plasters to the side became necessary, in order to relieve the pain. As an expectorant, a mixture of vinegar of squills, paregoric, spirits of nitre, and a small proportion of antimonial wine, was employed with singular efficacy.

Upon the subsidence of the measles as an epidemic, the hooping cough made its appearance among children, in a form of considerable violence. The symptoms were mitigated, and the disease shortened by exhibiting daily, or at times when the cough was violent, an emetic of white vitriol and alum.

Before the disappearance of the measles and the hooping cough, and towards the last of June, the bilious fever began to prevail. The earlier appearance of the fever this season than usual, was probably owing to the extreme heat in the early part of summer. There had also been a considerable quantity of rain, by which the country had been much drenched, and filled with ponds of stagnating water. The month of June, however, was excessively hot and dry, so

that the crops were much injured by the drought. The temperature of the weather was higher in June than in the succeeding months of July and August: for several days successively the mercury in Farenheit's thermometer ranged between 93 and 96° in the shade, during the heat of the day. The nights also, were excessively warm and uncomfortable.

The fever in June was of a considerably high inflammatory character. The pulse was hard, and the fever was attended with pain in the head, nausea, great heat in the skin, with a disposition to derangement and alienation of mind.

The epidemic this season, in Cahawba, was considerably less malignant than it was in the preceding: the same thing, however, was not observed in other places. In many parts of the country the disease was marked with unusual malignancy and fatality; and places where the disease during the preceding season was mild and free from danger, were, in many instances, this season, afflicted with the epidemic under a character highly malignant.

Though there was in the preceding season a considerable share of sickness in various parts of the United States, yet the malady of 1822 was far more general and extensive.—Places which had hitherto been considered unusually healthy, and had from their first settlement remained entirely exempt from disease, shared this season in the desolating and wide spread epidemic.

As the heat and peculiarity of seasons favorable to the production of yellow fever is not confined to one particular town or settlement, but prevails over an extensive range of country, so, in like manner, when sickness rages with malignancy in one place, the same general causes will spread the calamity over an extensive tract; acting with peculiar force wherever the physical condition of the country is such as to favour and promote their operation. This fact has been generally observed; and in the destructive yellow fever which prevailed in Philadelphia in 1793, it was remarked that a similar disease prevailed at the same time at Lynn, in Massachusetts; at Weathersfield and Coventry, in Connecticut; at New Galloway, in the state of New-York; on Walkill and Pensocken Creeks, in New-Jersey; at Harrisburgh and Hummelstown, in Pennsylvania; in Caroline County, Maryland; on the south branch of the Potomac in Hardie County; also, at Lynchburg and at Alexandria, in Virginia; and in several counties in North-Carolina.*

*Rush. Inq. and Obs. Vol. 3. p. 201—2.

Pensacola, which had hitherto been considered as a place of unusual healthiness, was this season visited by the bilious fever in a character of unusual malignancy: so that the city in the course of a few weeks was almost entirely depopulated by death and desertion. It was pretended by the advocates and friends of imported contagion, that the fever was brought in a vessel which arrived from New-Orleans about the beginning of August. The captain of this vessel was among the first that sickened and died of the malignant fever; and this, after his arrival in Pensacola: but as well for his own comfort as from the fear of contagion, he had, in the first of his illness, been removed about a mile and a half from the town to an elevated and healthy situation in the country. "It appeared on enquiry," says the board of health, "that he had been for ten days engaged in getting off a brig, which had been cast on shore near the Barancas, and during that time he had been continually exposed to the hot sun"—the vessel was extremely foul, and the smell on board of her intolerable. Subsequently, there occurred the case of a young lady, who was taken ill about twelve days after her arrival from New-Orleans, and who also died of a malignant fever. Now, it is very possible, and even probable, that the captain above spoken of, took the fever from the vessel which had been endeavoring to get off; but as it does not appear that the vessel which arrived from New-Orleans was either foul or unhealthy, we must suppose that the young lady above alluded to, took the infection after her arrival in Pensacola, and from the common source by which it was communicated to others. Nor would it be reasonable for the advocates of quarantine laws to suppose that where those salutary regulations are so strictly enforced as they are in New Orleans during the summer season, that the disease could be imported from that eden of health, where the strong and salutary arm of authority and law, like a guardian angel, holds the sword of protection for the safety and preservation of the people. The opinion of one of the most respectable physicians in Pensacola was, that the disease originated entirely from local causes. Such, also, was the conviction of the board of health, who forthwith appointed a committee to search out and remove all nuisances; one of which was a large quantity of semi-putrid and offensive fish kept by the merchants, and in the neighborhood of which the disease prevailed. Other causes, such as filthy lots, mud holes, &c. also existed; so that instead of endeavoring to seek a foreign source for this alarming and

destructive epidemic, in this, or in every other instance we find its origin at home. It is not presumed that such a knowledge and disclosure of facts can have a more injurious influence upon the settlement and improvement of Pensacola or any other place, than if it were contended that the disease was merely accidental and imported. On the contrary, the reverse may more rationally be expected; for what is proven by the most rigid enforcement of the quarantine regulations? Have they ever prevented the appearance and prevalence of the yellow fever in places where physical causes conspired to produce it? Let New-Orleans and the various cities and seaports of France, Spain and Portugal, decide the question. When the Catalinic and incendiary, who would scatter around him fire-brands, arrows and death, and spread ruin and conflagration through the city is within its walls, what would be the situation of the people, if, instead of searching out and detecting the domestic danger which they harbored among them, they should dread and expect their impending ruin from abroad?

The operations of nature, to a certain degree, are subject to the controul and influence of man; and it is only by an attention to the domestic and physical condition of our cities and towns, as well as to the state and situation of our settlements, that we can expect to derive any advantage in the improvement of health and the prevention of disease. The way in which this improvement is to be effected, I have already pointed out.

The visitation of 1822, was not the first time that the yellow fever has prevailed in Pensacola. It prevailed there as long ago as 1765, when in possession of the British; where, as in 1822, its origin was altogether referable to local causes; for we are informed by Dr. Lind, that the ships lying in the harbour, at the distance of a mile, were perfectly healthy. The observations of Dr. Lind upon this subject, will be found interesting, as well from their domestic relation, as from the intrinsic merit which characterises the writings of this judicious and scientific physician. "At Pensacola," says Dr. Lind,* "where the soil is sandy and quite barren, the English have suffered much by sickness; some, for want of vegetables, died of the scurvey; but a far greater part of fevers. The excessive heat of the weather has sometime produced in this place a severe fever, similar to that which in the West Indies goes under the name of the yellow fever. This, in the

*On the Diseases incidental to Europeans in Hot Climates. p. 36.

year 1765, proved very fatal to a regiment of soldiers sent from England, unseasoned to such climates, from the unfortunate circumstance of their being landed there in the height of the sickly season. It raged chiefly in the Fort, where the air, in the soldiers' barracks, being sheltered from the sea breeze by the wall of the Fort, was extremely sultry and unhealthy. And it is worthy of remark that during the fatal rage of this fever at Pensacola, such as lived on board the ships in the harbour escaped it." In page 171, of the same work, he again resumes the subject: "Lately (in 1765) when a mortal sickness prevailed at Pensacola, by which a regiment lately arrived there lost 120 men, and eleven out of twelve of the officer's ladies, who were landed with them, were said to have died; the companies of the men of war lying at a mile's distance from the shore, enjoyed the most perfect health. These ships were the Tartar and Prince Edward, of whose men those only who had been on shore, were siezed with this malignant fever, and all of them recovered when they got on board. It was likewise remarkable that such gentlemen as were siezed with this fever at Pensacola, and were carried on board ships, generally recovered; or at least, by this change of air, the fever being divested of its most mortal symptoms soon assumed the form of an intermittent. Pensacola, however, is of late esteemed more healthy than Mobile, where intermitting fevers prevail in the months of July, August and September. For these fevers, both in this and the other American colonies, we shall in general observe that the bark has been found a sovereign remedy, and ought to be administered on the first remission of the fever, as on its early administration will greatly depend the preservation of the patient's constitution."

We are informed by the same author that in the year 1766, sixteen protestant families, consisting of sixty persons were sent, at the expense of the government to West Florida. The ground allotted for their residence was on the side of a hill surrounded with marshes, at the mouth of the river Scambia. These new planters arrived in the winter, and continued perfectly healthy until the sickley months, (July and August.) About that time eight gentlemen, from one of whom Dr. Lind received his information, went to this new settlement to solicit votes for the election of a representative in the general assembly of the Province; by remaining but one night every one of them was siezed with a violent intermitting fever, of which the candidate for becoming a representative, and another of their number died.

The next day seven other gentlemen came upon the same business to this unhealthy spot; but by leaving it before night they escaped the sickness and all continued in perfect health. Among the French settlers during those two months, the annual fever of the climate proved so fatal on this unwholesome spot, that of sixty persons, fourteen only survived; and even those who remained alive in the September and October following, were all in a very ill state of health; not one of them had escaped an attack of the fever, and most of them died within a few months afterwards, from the injury it had done their constitutions.* Dr. Lind recommends the removal from an infected to a healthy place, as from shore to ship board, or from the low grounds of swamps to the hills, on the first invasion of fever, as being perfectly safe, and highly beneficial in mitgating and shortening the disease.

Similar causes to those which aided in producing the yellow fever of Pensacola in 1822, as great quantities of spoiled fish, beef, and other articles of a perishable nature, also contributed towards the production of the yellow fever in New-York in 1798.†

Extensive, accurate and general observation have confirmed, beyond the power of contradiction, the truth of the following circumstance in the philosophy and physiology of nature, that the destruction of trees and forests, which takes place upon the first settlement of a country, is highly injurious to the health of the inhabitants. This circumstance will serve to explain why various parts of Alabama which had proved previously healthy, were in the summer of 1822 visited with the prevailing epidemic. The settlement of one or two families in the uncultivated woods of the same vicinity, for the first year or two remains exempt from disease: but when the settlement has considerably increased, and the destruction of timber become general and extensive, such places are rendered extremely unhealthy. This is liable to happen not only in the vicinity of creeks and rivers, but also in places removed beyond the influence of any stream or ponds of stagnating water; in situations which to the eye of attentive observation afforded every recommendation and prospect of health. Such places have again been known to become healthy a second time, in the course of a few years. The philosophy of this phenomenon has, I believe, been already explained in the preceding part of this

* On the Diseases incidental to Europeans in Hot Climates.
† See Dr. Bayley's letter, Med. Repos. vol. 2, p. 289.

work, and may be briefly accounted for in the following manner. When, by the process of cultivation, and by exposure to the sun and air, the soil has lost a portion of the light decomposible or corruptible matter which abounded in excess upon its first clearing, and when the timber which had been killed is entirely destroyed and consumed, as the sources of decomposition are thus lessened, the atmosphere recovers again its former purity. The facts to which this explanation refers are too fully established by accurate observation to admit of being called in question. Nor can it be reasonably objected that because we are unable, in every instance, to account for the origin of fevers and epidemics, we are therefore necessarily ignorant of their nature and origin altogether. Much, undoubtedly remains to be discovered; but it does not follow that because we are not masters of the entire scope of medical science, we should therefore reject even the little that is established with all the support and authority of probability and truth.

I have in some instances remarked that those who had labored upon severe attacks of the bilious fever one season, were exempted from the influence of the prevailing epidemic in the subsequent year. This, however, is not a general rule; as I have known many to sicken, and not a few to die of the bilious fever, after repeated attacks of the disease for several years successively.

If the bilious, or yellow fever were, like the small pox, liable to affect a person but once in the course of his life, the ravages of this endemic scourge of hot climates would be diminished in a tenfold proportion, and its destructive effects would be confined almost entirely to strangers and to emigrants from healthy climates: whereas it now makes little distinction, for although persons lately arrived from the cool salubrious regions of the north are the greatest sufferers, yet the native and ancient residents are also its frequent victims.

The symptoms of the disease this season were much the same as in that of the preceding. The comparative malignity of the fever between the town and country was reversed from what it was in 1821. At that time the epidemic was more malignant in the town than in the neighboring country; in 1822 the fever was milder in the former than in the latter situation.

There were but about six or seven weeks during the latter part of the summer that I was able to pay much attention to practice. From fatigue and exposure in the discharge of my professional calling, I was taken ill early in the sea-

son, and frequent relapses confined me to the house the greater part of July and August. I, however, saw and experienced enough of the sickness to gain a pretty correct knowledge of its character and appearance, as well in the town as in the country.

Yellowness of the skin, so common in the fever of 1821, was this season but seldom observed. The black vomit was also rare; though black, dark green and livid stools were common. Vomiting of discolored matter, of various shades, brown, snuff or clay colored, olive, green, &c. was frequently observed. The vomiting of these brown and dark colored fluids was generally an indication of a severe and dangerous disease.

Prostration at the commencement of the disease was less frequent than in patients of the preceding season. There was, however, in many patients a great disposition to affections of the brain; there was generally a considerable determination to this organ; and often the intellect was completely deranged, or entirely annihilated during the exacerbation of the disease.

The fever was more of the remitting and intermitting character than in 1821; but notwithstanding the complete remission or even intermission of the fever, symptoms of extreme danger and malignity frequently appeared during the continuance of the paroxysm. This was generally ushered in with a chill of greater or less severity, and of different and uncertain duration. As the sensation of chilliness went off the fever gradually rose. In several instances the patients complained of great heat, when the skin to the touch felt no warmer than natural. Others complained of cold when the skin was preternaturally hot.

Irregularities of the paroxysms was one of the most striking peculiarities of this epidemic. The disease would sometimes come on with the symptoms of fever and ague; being ushered in with a strong sensation of cold and a severe shivering. This would be followed by one or two regular paroxysms of the fever and ague; the intermissions, however, would become less considerable, so, that at length, the disease would assume the complete continued form; in which, although there might be a slight mitigation of the symptoms, yet at no time would the remission amount to a complete apyrexia or absence of fever. It is difficult to determine how long the fever would have remained in this continued state without the aid of medicine; this much is certain, that the more the fever assumed the continued form, in the same degree did it become more obstinate and malig-

nant in its nature. On some occasions I have known the fever to continue a week or more, with scarcely any abatement of its symptoms; and at no period of this time was there a sufficient remission to authorise the use of the bark.

The heat and excitement were not unfrequently very unequally distributed. In general there was an unusual accumulation of heat and irritation about the epigastrium, or pit of the stomach; the head was also hot and painful. In a few the extremities were unusually hot, while the body possessed no more than its natural temperature.

Palpitation of the heart appeared to be less frequent than it was during the preceding season: though an irregular and intermitting pulse was often observable. The latter has generally been considered a fatal symptom; although this was by no means generally the case in the disease under consideration, yet, usually, it was an indication of great malignity and danger.

The appearance of the tongue was various. In many cases, and in some which were marked with pretty severe symptoms, it was very little altered from its healthy state; appearing of a bluish or lead color, from the thinness of the fur spread upon its surface. This was more especially the case with patients in whom there was at the same time a strong tendency of typhus. In such cases there was frequently an absence of all inflammatory symptoms, or high febrile action; the pulse becoming frequent, soft and tremulous, easily compressible, with very little strength or firmness of action. In such cases the face would sometimes become flushed, and a circumscribed dark red, or purple spot would appear upon both cheeks. The latter symptom was a source of deception to the inexperienced, in as much as it was mistaken for the color of returning health; from which, indeed, it was very different, both in its real character and appearance. This dark red, purpleish, or bluish suffusion was not confined in every instance to the face, but in a few affected also the arms, breast and throat. It generally appeared in the latter stage of the disease, and after the disappearance of the more acute symptoms of excitement. As but one patient in the writer's practice fell a victim to this fever alone, this symptom could by no means be considered as a fatal one, though it was in the more violent and malignant cases that it made its appearance.

The thirst was not generally very great, except where sickness of the stomach prevailed, and there was a frequent vomiting or effort to vomit, the thirst was then excessive and insatiable, and such was the irritability of the stomach

that whatever was received was almost sure to be instantly rejected.

Suppression of urine sometimes took place: this symptom, however, was of rare occurrence. The urine during the paroxysm was often pale and watery, though sometimes small in quantity and high colored. During the remission it was more or less of a reddish orange cast, and deposited a lateritious and cloudy sediment.

Persons of superficial observation might be inclined to believe that perspiration could scarcely be considered as a critical solution of this disease; for many patients recovered with very little appearance of this excretion; and in others it was more or less profuse without affording any sensible relief. It often happened that the perspiration was profuse on the subsidence of the first paroxysm, and very partial and inconsiderable afterwards. It is, however, worthy of observation that the most perfect crisis were those attended with a free, warm and general perspiration; continuing from ten to twenty-four hours. On the other hand, where the fever went off with but a little or partial appearance of this salutary discharge, the crisis never appeared to be complete and perfect: the person generally, remaining in a feverish state, listless, languid, inactive, and unable to take exercise without exciting a feverish commotion in the system. It was, moreover, remarked that when the paroxysm terminated by a free perspiration, the fever was of shorter continuance than in those cases where no perspiration appeared. A copious secretion and discharge of urine was vicarious of perspiration and often proved critical.

Those copious cold clammy sweats, accompanying cases of sudden and extreme prostration, and which were so frequent in the fever of the preceding season, were much less common during the present epidemic.

Hæmorrhagies, or bleedings from the nose, might in some cases be considered as critical discharges: they were however, more frequently the mark of an unusual determination of blood to the head; and seemed to indicate the previous necessity of venesection. I never knew this discharge to be productive of any bad consequences; on the contrary, it was pretty certain to afford relief to the pain of the head; which generally attended or preceded this symptom, and which was often severe and distressing. This circumstance should be borne in mind, as in similar epidemics, it will prevent an over anxiety in the friends and attendants to stop the bleeding.*

*I am aware that there are instances of epidemic bilious fever where hæ-

A discharge of blood by vomiting and purging was, likewise, sometimes observed; though no case of this description which terminated fatally came within the author's knowledge or observation.

Vomiting was frequently a troublesome symptom; after ushering in the cold stage it was not unusual for it to continue through a considerable part of the hot stage; thereby defeating our efforts to exhibit any thing by the mouth. This symptom, however, was neither so frequent nor so violent as it was during the preceding season.

There was, generally, a considerable disposition to costiveness; and frequently a difficulty in moving the bowels by the exhibition of cathartics. This was more especially the case in the early stage of the complaint, or at later periods, where medicines of sufficient strength had not been previously exhibited. Where the stomach and bowels had been well evacuated at the commencement, this disposition to constipation was in a great measure removed, and the bowels were thereby rendered soluble, and more easily operated on at a subsequent period of the disorder.

Hiccup, when occurring in the early stage of the disease, was not to be considered as an indication of iminent danger, on the contrary it frequently took place at this period, and was then neither troublesome nor alarming; but when supervening at an advanced stage of the disease, and where considerable debility already existed, it might then be looked upon as a dangerous and alarming symptom. It then often became deep, sonorous, and obstinate; agitating the whole frame, and seeming to convulse every muscle of the body; at other times it was low, deep and gulping. Its continuance was debilitating and distressing. This symptom appears to have its seat in the stomach, thence calling the diaphragm into convulsive sympathy. This affection may be attributed to various causes, as 1st, to the application of some particular irritation when the stomach is in a debilitated state; 2dly, a degree of inflammation; 3dly, incipient mortification, or gangrene. Of these three conditions of this organ, it is probably the last, or a state bordering upon it, that gives rise to hiccup in the advanced stage of bilious fever. Dissections after death demonstrate that the stomach and bowels often suffer a very

morrhagies from the nose and other parts are among the fatal symptoms. This was the case in the epidemic of the town of Natchez on the Mississippi, in the summer and autumn of 1823, where persons would be taken in the morning and die before night, with blood streaming from every orifice in the body.

considerable degree of inflammation in diseases of this character. Indeed, traces of inflammation, sometimes bordering upon mortification, are almost invariably present in the stomachs and bowels of those who have died of the bilious or yellow fever; and sometimes mortification itself has been detected in the stomach after death. The presence or absence of hiccup is no certain criterion, however, of the degree in which the stomach may be affected: for although hiccup may, and does, attend inflammation of this organ during the latter stages of the disease, yet we know that inflammation frequently takes place without being accompanied by hiccup.

Symptoms of an uncommon and anomalous character accompanied this disease in a few instances. In one patient I observed a violent palpitation or fluttering of the heart, accompanied with an entire derangement of the arterial system. In one arm the pulse was extremely rapid and intermitting, in the other it was regular and slower. In this patient the febrile excitement was particularly increased in the extremeties and head; the feet, hands and head being extremely warm, whilst the temperature of the trunk was very little, if any, increased above the natural standard. The intellect for the time, that is, during the continuance of the paroxysm, was entirely annihilated, or suspended in its operation; violent impressions alone being able to rouse him to any degree of consciousness, and then but for a moment; the patient suddenly relapsing into his former state of lethargy. The latter symptom was often observed both in the epidemic under consideration, as well as that of the preceding season. In the patient above alluded to, the puncture of the lancet in bleeding seemed to produce a momentary sensation, and occasioned a slight twitching of the arm: the affusion of cold water produced a more general shock, though consciousness was not restored by either. The fever in this patient, as in most others, was of the remitting character; and although the apyrexia was by no means perfect, yet it appeared sufficiently so to justify the use of the bark, which was exhibited in as liberal quantity as the patient could be prevailed upon to take it. He recovered.

Local situation had considerable influence in modifying the character of this fever, and in rendering it more or less malignant. It was, generally, more severe upon the creeks and rivers, than at the distance of a mile or two from water courses, though upon the same stream, within the distance of a few miles, there was often a considerable difference in the mildness or severity of the symptoms,

Though the disease often partook very much of the intermitting character, in being marked, in many instances, with perfect intermissions, and the paroxysm again returning with severe chills or agues, yet it was of that description which Dr. Alibert, Dr. Hamilton and others call the *ataxique* or *Malignant Intermittent.* Notwithstanding the patient might feel comparatively comfortable during the remission, and even be able to walk about, yet when the paroxysm returned and the fever rose, there was often the appearance of iminent danger: the nervous system being very materially affected, as indicated by alienation of mind in a greater or less degree, and by the complete suspension in the exercise of the intellectual faculties. The latter might be called the *lethargic state of fever;* commencing with symptoms of high excitement in the vascular system, and going off gradually with the subsidence of the febrile action; so that when the fever had departed, the mind again became clear and tranquil.

In those cases which indicated danger, the *turn of the fever*, as it was called, was the critical period of life or death. When the hot stage had been suffered to run high, the powers of life became exhausted by the violence of the action, and the prostration which ensued as the fever subsided was often surprising and irremediable; life vanishing with the departure of the fever. But few cases of this description, however, came within my knowledge during this season; in the epidemic of 1821 it was an occurrence of more frequent observation.

Sickness this season was particularly severe upon children. In this town and vicinity the deaths were principally confined to them. This peculiarity appears to have been owing to the following causes. 1st, Early in the spring the measles made their appearance, and though not generally severe or malignant, yet had considerable influence in weakening and and deranging the constitution, and increasing its susceptibility to subsequent attacks of disease. 2dly, Upon the decline of the measles the hooping cough began to prevail, and at length became a general epidemic: the latter complaint was commonly severe and of long continuance. Towards the latter part of June, and as the hooping cough began to decline, the fever appeared. This was sudden in its origin, and, at the commencement, attended with pretty severe and violont symptoms. The weather at this time was unusually hot; and for some weeks the atmosphere was not refreshed by a drop of rain. It has been said that two general diseases of a different nature cannot prevail in

the system at the same time: but if we admit, with nosologysts, that hooping cough is a general disease, the advocates of this doctrine will be driven from their position, from the circumstances connected with the epidemic now under consideration: for in numerous instances I observed that the invasion and presence of fever had no influence in suspending the progress or moderating the violence of the hooping cough. And it appears to have been owing to this combination of diseases, in constitutions previously debilitated by the measles, that the unusual mortality among children this season was to be attributed. To this combination of diseases may also be added the dysentary, which was a common complaint at the same time: and it was not unusual to observe the three diseases, the fever, hooping cough and dysentary affecting the same patient simultaneously. It might, however, be more proper to consider the dysentary as a symptom of fever than a distinct disease. This affection of the bowels was often very distressing, and had a considerable share in accelerating the fatal termination in such children as became the victims of the disease.

The fever in children was often ushered in with convulsions, which were also liable to supervene and to be repeated in the course of the disease. This was a dangerous symptom, very few recovering who were affected in this manner.*

Throughout the progress of the fever the hooping cough was often distressing and severe, and was sometimes among the last symptoms of the disease: the little patients, from the violence of the coughing, seemed, not unfrequently, to be in danger of suffocation.

Children were more frequently affected with coma and stupor than grown persons.

In this, as in the fever of the preceding season, worms were frequently discharged by children, both by vomiting and stool. This symptom was apt to accompany the worst cases.

I assisted this season at the opening of the body of an elderly person, who died of bilious fever, in the neighborhood of this place, after a short illness. The inner surface of the stomach was found somewhat inflamed; but what chiefly struck our attention was a considerable quantity of brown coffee colored fluid floating in the stomach with a black floculent sediment, resembling soot. We dipped out a saucer

* Convulsiones cum febre acuta pernicium denunciant nimium vero, pueris. Heppoc. Coac. Prænot. Op. Om. p. 157.

full of this matter and fluid for more particular examination, and found its appearance as above stated. The bile, in the gall bladder was black and viscid, resembling tar in appearance and consistence, and perfectly free from any tinge of green. During the season of 1821, when the disease was more malignant than it was the present, I witnessed a number of cases, where matter similar to that above described was discharged both by vomiting and stool.

The disease this season required much the same treatment as that of the preceding summer and autumn; viz. bleeding, emetics, the cold bath and other febrifuge remedies.

Blood-letting at an early period of the complaint was generally indicated by the strength, tenison and frequency of the pulse. The quantity to be drawn was regulated by the feel of the artery; and, in general, the blood was permitted to run till an evident change had taken place in the action of the vascular system. The pulse becoming soft and yielding afforded the best criterion for regulating the extent of this evacuation. Sometimes eight ounces might be sufficient for the purpose, at others sixteen and even twenty, at a single blood-letting, were required. In having recourse to this operation, as previously remarked, the age, sex and habit of the patient, and the effects of the evacuation were leading considerations in the extent of the remedy. I remarked that when the pulse was rendered softer and slower, the benefit was generally more sudden and considerable than when the pulse became softer and more frequent. To this, however, there were exceptions. Sometimes after a pretty free evacuation of blood, the pulse became frequent and intermitting; to the inexperienced this might prove alarming; but where the operation had been authorised by the previous state of the excitement, and high vascular action, no danger was to be apprehended; on the contrary, it was generally found that blood-letting under these circumstances cut short the paroxysm, and contributed materially to bring about a critical solution of the fever.

It was not in every case of fever that blood-letting seemed to be required. Where the arterial action was but little increased in frequency and force, the employment of venisection was omitted; not so much, however, from an apprehension that it would prove injurious, as from the persuasion that the cure might be safely committed to other means. But comparatively few cases, however, were of this description, even in cases of the mildest form, the excitement during the hot stage would run high, and authorise and require the free use of the lancet.

The utility of blood-letting was not confined entirely to the commencement or early stage of the disease: On several occasions I was called to patients who had labored under the fever for four, five or six days, and whom, from the high action, strength and tenison of the pulse, I had then no hesitation in bleeding for the first time: nor did I ever have occasion to repent the employment of this remedy under these circumstances; even when blood letting had been performed in proper quantity at the commencement, it was often proper to repeat it during the progress of the disorder. Sometimes bleeding was required once or twice a day, for two or three days in succession: for though there might be a temporary abatement of the symptoms from the operation, yet the pulse, in a few hours, would often acquire its former strength and hardness. In such cases there seemed to be a great disposition to local congestion and inflammation; and the blood drawn would frequently exhibit a thick buffy coat, or inflammatory crust upon its surface.

As to the stage in which blood-letting was most proper and beneficial, it may be useful to make a few remarks. As this disease was generally of the remitting character, consisting of distinct and repeated paroxysms; the only period at which this remedy could be employed with decided advantage, was the hot stage, and whilst the fever was at its height. The object of venesection is to diminish the violence of the excitement and allay the inflammatory action; thereby relieving the general system and the overstrained vessels of the different organs and viscera of the body; and, in this manner, anticipating what would be less perfectly accomplished by the regular and uninterrupted course of the paroxysm. Besides, the debility produced by blood-letting is but temporary, and, according to the language of the Brunonean school, of the direct kind; that is, debility produced by abstraction of stimulus; whereas the debility occasioned by the excitement which prevails in the paroxysm of fever is of the indirect kind and more permanent in its nature. From this view of the subject it appears that blood-letting at any other time than in the height of the paroxysm must be of doubtful utility. For if employed during the abatement of the fever, under ordinary circumstances, the directly debilitating effects of this evacuation are added to the indirect debility occasioned by the paroxysm: and if had recourse to during the apyrexia, its employment must be without object or design, as there is no indication of cure which it can possibly accomplish at this period. It often happened that the fever assumed the continued

type, that is, I have known it to last two or three days without any sensible abatement; in such cases blood-letting could scarcely be mistimed, or employed to the disadvantage of the patient. In recent cases, also, where the pulse was hard and strong, and in robust constitutions, blood-letting was employed with advantage during the remission.

After the bleeding, if this had been required, as it commonly was at the commencement of the disease, an emetic was generally exhibited. Much depended upon the proper administration of this remedy, and in nothing was the presence of the physician more required than in the exhibition of this article. Such was the difference in the irritability of the stomachs of different persons, and in the difficulty or facility of exciting the action of vomiting, that a dose which would operate severely upon one, would produce scarcely any impression upon another. The emetic generally employed was the tartarised antimony, dissolved in warm water, and exhibited in divided doses. Commonly from six to ten grains was sufficient. To exhibit more was unsafe, and even in this quantity, unless it was thrown off by vomiting, it was apt to operate as a powerful cathartic; and in malignant cases great and sudden prostration would sometimes be occasioned by it. In persons of delicate and debilitated habits, and where emetics were indicated in the progress of the disease, I gave ipecacuanha and white vitriol in combination. This operated mildly, and could be repeated, so as to cleanse the stomach effectually, without incurring the danger of prostration; fifteen grains of white vitriol and fifteen of ipecac. was a moderate, and a generally sufficient dose for an adult.

Such was the disposition to accumulations of bile in this disease, that the repetition of emetics in the progress of the disorder was sometimes necessary: where the bowels, however, were kept properly evacuated, this was seldom required. The effects of this remedy were sometimes surprising. I have seen patients laboring under bilious fever in whom the presence of typhus was strongly marked with symptoms of iminent danger, such as stupor and derangement of mind, a frequent, small and weak pulse; who were suddenly relieved by the operation of a few grains of white vitriol.

After the emetic had operated freely, the patient, if he had been much fatigued by it, was permitted to rest for a few hours before a cathartic was exhibited. It often happened, however, that the tartarised antimony also acted as a cathartic; this was more especially the case in those instances where it had exerted but little influence as an emetic.

Previously to the exhibition of the cathartic it was necessary to attend to the state and condition of the patient; for if the disease was of a malignant character, however necessary it might be to procure free evacuations from the stomach and bowels, the patient was in danger of being prostrated by the too considerable operation of the medicines employed, or by their too frequent or rapid exhibition. This prostration of strength was more apt to ensue from giving an emetic or cathartic during the paroxysm, than from their employment in the absence of fever; and in proportion to the malignancy of the disease. Such was the disposition to prostration and collapse from the operation of evacuating medicines, that I have seen patients, who in the morning were able to walk about, to be affected before night with cold clammy sweats, sunk eyes, livid and dejected countences; the pulse, at the same time, being weak, frequent and scarcely perceptible, and all this from the exhibition of a dose of tartar emetic during the paroxysm. Such consequences as this, however, were more apt to take place in the epidemic of the preceding season than in the one under consideration.

With respect to the employment of cathartics and the cold bath, little need be added to what has already been said upon the same subject in treating of the fever of the preceding season.

In place of calomel and jalap, I generally exhibited calomel and castor oil. I found the latter less offensive to the stomach than calomel and the former, less apt to nauseate and produce griping, and at the same time quite as certain and effectual in its operation. From ten to fifteen grains of calomel and an ounce of castor oil was the usual dose for a grown person.

A very useful laxative, used in the progress of the complaint was cream of tartar. Where a mild cathartic was required, as in those cases in which the fever was moderate, this medicine was exhibited with advantage. Where a febrifuge also was necessary between the exhibitions of more active doses of medicine, I have given this in combination with spirits of nitre with decided benefit. My directions were to give a tea spoonful of spirits of nitre and about an even tea spoonful of cream of tartar every two or three hours during the continuance of the fever.

Where the fever was of the low, nervous, or typhiod character, with a clean moist tongue, a small, frequent and soft pulse, sick stomach and a dry skin, I have given, with the best effect, powders composed of antimonial or James' powder three grains, nitre six grains, calomel from one to two

grains, and camphor three grains every three hours, assisted in their operation with a little warm herb tea; they were very effectual in promoting perspiration, quieting the sickness of the stomach, and in bringing the fever to a salutary crisis.

The cold bath was employed this season with considerable benefit. It was not, however, in every instance equally serviceable; and in some cases it was used without procuring any permanent relief. This much, however, may be said in its favor, that when it failed in proving manifestly advantageous I never knew it produce any injury; and the numerous instances in which it proved serviceable entitle it to a high consideration among the remedies of bilious remitting fever.

In the use of the cold bath regard should be had to the quantity of the water affused, as more than is necessary to reduce the temperature of the body to a certain degree may produce injurious effects: eight or ten gallons, or a couple of common buckets full, were generally found sufficient. It was in some instances necessary to repeat the remedy two or three times in the course of as many hours, before the desired effects were produced. In most cases, however, it happened that even one affusion produced an abatement of the fever, and frequently the appearance of perspiration on the surfaces of those who for many hours had been parched with a burning fever.

Where the remissions were pretty distinct the bark was generally exhibited with advantage. There were many cases, however, in which this medicine could not be taken in any quantity without discomposing the patient and aggravating the complaint; occasioning a distressing sickness, restlessness and anxiety, flushing of the face, and an increase or return of the fever. These consequences of its exhibition seemed, however, to occur principally in those patients whose stomachs and bowels had not been sufficiently cleansed, and in whom there was a considerable redundancy of bile. Though in many cases it could not be clearly ascertained whether the bark would prove beneficial or otherwise, yet in general where the fever had subsided with the appearance of a universal perspiration, where the intellect was clear, the patient composed and free from anxiety or any particular uneasiness, the bark was exhibited with a fair prospect of success: and even in cases of an opposite description, where there existed a considerable degree of head-ache, some fever, uneasiness, &c. the bark was often given with the best effect. It likewise proved, on many oc-

casions, an efficacious diaphoretic: persons, whose skins had been uniformly dry, would often become moist, with a kindly perspiration over the whole surface of the body, upon taking one or two doses of bark. Generally the bark acted as a moderate laxative. though in some it had a contrary effect upon the bowels; and in such apperient medicines were required to keep up the regular action of the intestinal canal. Independent of any particular condition produced by the fever itself, there appeared to be some stomachs of such an irritable nature as not to bear this remedy in any form or quantity. It often happened that when the bark in substance nauseated, it might still be taken without producing any inconvenience, when given in decoction or infusion with the addition of some aromatic, as cloves, mace, cinnamon, &c. In preparing the infusion, directions were given to pour a point of boiling water to a table spoonful and a half of bark, to which a little coarsely powdered cinnamon and a few cloves had been added. Of this the patient was directed to take a wine glass every hour, or in such quantity and as often as the stomach would bear. If in this way the patient could not bear the mixture of bark, the liquor was directed to be poured off and taken clear.

Where the paroxysms, as often happened, were attended with dangerous and alarming symptoms, expediency and prudence required that we should use every means to prevent their return: with this view I have directed an ounce of bark, and even two ounces, when the stomach could bear it, to be taken in the morning, or a few hours before the expected return of the paroxysm, in the quantity of two or three drachms at a dose, repeated every hour, in the manner of Torti. It often happened, in cases where the fever had not entirely subsided, that the exhibition of one or two doses of bark had the effect of subduing the slight febrile action that previously existed, especially if perspiration was produced. I have never found, however, in the course of my practice, what other physicians have stated as having experienced, viz. the benefit and efficacy of bark exhibited throughout the paroxysm, as well when the fever was at its height as during its remission: but on the contrary from the carelessness or want of discrimination in the nurses and attendants, I have known very unpleasant symptoms occasioned by the exhibition of this article, when a considerable degree of fever prevailed at the same time. The practice of prescribing bark throughout the paroxysm of fever, appears to be founded in a speculative and erroneous theory of the disease, viz. that its proximate cause consists in debility,

and that to cure the fever we must overcome this debility by the use of tonics, without regard to the symptoms; a theory as pernicious in its application as it is unfounded in fact.

There is one circumstance which it is of some importance to bear in mind, viz. that unless the stomach and bowels have been pretty well cleansed from redundancy of bile, the bark will prove of little benefit, and in all probability will aggravate the symptoms. This is very apt to be the case in the early stage of the bilious fever, where, although no evacuations have been made, the fever remits in the usual manner, and these remissions are imprudently seized upon as fair opportunities for exhibiting the bark. It is scarcely necessary to observe, that under these circumstances, with the stomach and bowels abounding with bile and impurities, no benefit can be expected to result from the exhibition of this otherwise useful medicine. The attendants, friends, and physician were, perhaps, flattered with the belief, that from the preceding mildness of the symptoms, and the complete absence of the fever during the apyrexia or remission, that no danger was to be apprehended: the succeeding paroxysm, however, convinces them of their error, when they find that in spite of all their untimely efforts, the strength to fail, the pulse to sink, and a deadly coldness to extend, by degrees, from the extremeties to the heart itself.

It generally happened after a severe attack of the endemic, that the patient during the continuance of the infirm and debilitated state which succeeded, was liable to frequent returns of fever; and it was by no means rare for these subsequent attacks to be as severe as the primary disease. It is obvious that such relapses required the same treatment as the original disorder; with due regard to, however, and allowance for, the existing debility. Even under the most favorable circumstances, invalids from this disease was often, and I believe generally, subject to relapses more or less severe. In many cases these were nothing more than slight *chills and fevers*, unattended with malignancy or danger. It was here by no means necessary to carry the patient through the whole routine of medical treatment required in the primary disease. Operating on nerves and fibres relaxed and unstrung by preceding illness, a slight exposure, fatigue or act of imprudence is sufficient to occasion a feverish disorder in the system. In such cases it was generally sufficient to exhibit some gentle purgative, as cream of tartar, castor oil, &c. to cleanse the bowels and quell the fever; and after its operation, during the remission, to take the bark freely,

which was continued in pretty liberal quantity for a day or two, and then gradually diminished and continued for a few days longer, till the strength, was in some degree confirmed, and the constitution secured against relapse.

There is an anomolous symptom in the intermitting as well as in the remitting fevers, which, though not peculiar to the epidemic under consideration, yet as it has not been previously mentioned it may not be improper to notice in this place. Instead of chills and fevers the patient would be seized every day, or every other day, with a severe pain in some part of the body, as the head, eyes, back, calves of the legs, &c. One day there would, perhaps, be a fever attended with this excruciating pain, and the next the local affection would be unattended by any febrile affection, and so on alternately. Complaints of this nature are sometimes looked upon as strange and alarming by those who are ignorant of the protiform character of fever, but in this a person of experience can never be mistaken. These local periodical affections were treated in the same way as the fever and ague. The return of pain might be anticipated and prevented by exhibiting eighty or a hundred drops of laudanum about an hour and a half, or two hours, before the attack was expected; or by taking an ounce or two of bark between the paroxysms.

In the debilitated state in which the body is left after an attack of bilious fever, and whilst a slight fever with irregular evening exacerbations still hangs about the patient, in this enfeebled and relaxed condition of the system, the mineral acids were given with the greatest advantage. For this purpose either the nitric or muriatic acid was employed. If there was any degree of, or disposition to viseral affections, particularly of the liver or spleen, as often happened, the nitric was peculiarly serviceable, in as much as it acted as an alterative, a general resolvent and remover of obstructions, a corrector of the vitiated or scorbutic state of the fluids produced by fever, and a tonic and stomachic, without producing any feverish excitement. I have given from thirty to forty drops of the nitric acid five or six times a day, for several days, and even a month or more. To about thirty-five drops of acid half a pint of water may be added, and sugar or molasses sufficient to cover and conceal its roughness. If the stomach is not able to bear it in this quantity the dose may be diminished. As the muriatic acid is not so strong, a larger quantity should be exhibited.

Having spoken pretty fully upon the subject of acids, both of the mineral and vegetable kingdoms, under the head

of the general treatment of fever, the less will be necessary here. I will, however, remark, that from my own experience I am fully satisfied of their superior utility and importance. In all malignant cases, where typhoid symptoms showed themselves early, the nitric and muriatic acids were exhibited with decided advantage. The time is probably coming when the vegetable and mineral acids, from general experience, will be found as specific in the cure of fever, as they are in the prevention and cure of scurvy. This is not to be taken as the extravagance of opinion, founded on hypothesis, and unsupported by truth and probability, but as the result of experience and correct principles in medicine.

Consequences of Fever.—Affections of the liver and spleen are common consequences of bilious fever. The spleen is also frequently enlarged from a long continuance or repeated paroxysms of the fever and ague. This latter complaint is sometimes productive of much inconvenience and danger; by its weight, bulk and by the compression of the neighboring parts, it renders the breath short, laborious and panting, upon any sudden exertion; the countenance becomes pale and bloated, the person weak and emaciated, dropsy ensues and death closes the scene. I have on several occasions seen the spleen so much enlarged as to occupy nearly the whole circumference of the abdomen, filling completely the whole of the left side, projecting up into the thorax and down to the lower extremity of the pelvis, rendering the patient's body stiff and almost inflexible, extending past the linea alba and a considerable distance into the right portion of the abdomen. My success in the treatment of such cases has thrown a great number within my observation. My principal remedies are nitric acid, calomel and frictions over the seat of the diseased viscus with mercurial ointment; to these remedies are sometimes added venesection, and the use of an active cathartic once or twice a week. The calomel is given in the quantity of from two to four grains daily, until the mouth has become slightly affected, which is kept in this state until a cure is accomplished. The nitric acid is exhibited at the same time, in the quantity of twenty-five or thirty drops in half a pint of water, well sweetened, four times a day. A small piece of mercurial ointment is rubbed upon the abdomen three or four times a day: independent of the ointment, the friction itself is of very considerable benefit, in promoting absorption and resolving the enlargement. To all of which may be added the use of exercise on horseback, daily, to such an extent as the strength of the patient will admit.

In most instances this enlargement of the spleen decreases with the progressive improvement of the general health of the patient during the period of convalescence; in others, instead of diminishing, it remains stationary, or continues to increase.

Enlargements and schirrosities of the liver required the same treatment as those of the spleen. In both, spirituous liquors and animal food should be religiously abstained from; vegetables of easy digestion, fruits and vegetable acids may be eaten in moderation; care being taken not to overload the stomach, so as to produce flatulency and indigestion.

The plan of treatment above laid down I consider as specific in the cure of those affections, as the use of bark is in the cure of intermitting fever; so successful, indeed, has it been in my hands that I have never met with a single failure.

To expedite the cure in cases of enlargement of the spleen, where there is no fever, I sometimes prescribe, in cases of debility, vegetable bitters.

Where dropsy accompanies these enlargements I give digitalis, after the gums have become affected by the exhibition of mercury. The preparation I employ is the dried leaves pulverised, from one to two grains three times a day; to be continued till the head becomes affected with vertigo; the stomach with nausea, or until the pulse is rendered considerably slower; it is then discontinued a few days, and again resumed should the symptoms require it. Vinegar of squills, saturated with nitrate of potash, is also employed, a tea spoonful three times a day: For constant and only drink the patient is ordered to use cream of tartar and water, in the proportion of a tea spoonful of the former to half a pint of the latter—in addition to all which I prescribe a dose of cream of tartar and jalap once or twice a week, according to the strength of the patient: exhibiting from half an ounce to an ounce of cream of tartar and from twenty to forty grains of jalap, according to the facility and power with which these medicines operate on different patients; regulating the quantity so as to cause a brisk operation.

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